Comparison of the Effects of Soft Contact Lenses for Myopia Control on Accommodative Esotropia

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Purpose

Increased incidence of myopia in children has led to the concern of development of ocular complications with continued progression. Myopia interventions mitigate these effects; however, practitioners must select treatment based on individual attributes, including binocular/accommodative function at baseline. Binocular dysfunction is related to myopia onset, and myopes often exhibit esophoria, high AC/A, exotropia, anisometropia, and accommodative lag[1]. This case investigates the impact on binocular vision (BV) and accommodation of threes soft contact lenses for myopia management (SCLM), on a patient with accommodative ET (AET) and moderate myopia.

Case Report

8-year-old black male (figure 1) presents for myopia management consultation with complaints of diplopia and reduced academic performance. Patient's calculated progression rate was 2 D per year.

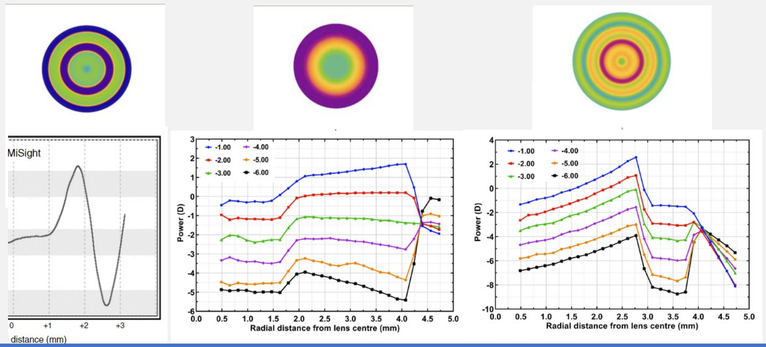
Exam findings		
Spec rx (based on cyclo)	OD -4.50-0.50X106 DVA: 20/20 NVA: 20/25 (fluctuating) OS -4.75-0.25X077 DVA:20/25 NVA:20/30 (fluctuating)	
CT	Dist Ortho	Near 20 IAET, with +2.00 OU CT' ortho
AC/A	10/1	
Vergences	Dist BI X/10/8 BO X/25/15	Near BI X/18/12 BO X/40/30
MEM	+1.25/+1/25, with +2.00 OU MEM +0.50/+0.50	
Acc amps	OD 14.5 D	OS 9.5 D

Diagnoses: Accommodative esotropia; Astigmatism OU; Shallow amblyopia OS; Myopia OU

Contact lens trial	Trial A (Dual focus; omafilcon A)	Trial B (Center D; comfilcon A)	Trial C (extended depth of focus; etafilcon A)
BCVA	OD: 20/20 OS: 20/25	OD: 20/25 OS: 20/30	OD: 20/20 OS: 20/25
CT' (at fit)	2 Exophoria	2 Exophoria	2 Exophoria
CT' at 2 week f/u	30 IAET (comitant)	30 IAET (comitant)	
Fit	Least inferior decentration	Moderate inferior decentration	Most inferior decentration
Comfort	Preferred	Not Preferred	Not Preferred

Following 2 weeks of CL wear, patient's IAET became re-manifest with CL adaptation. CT' following 15min adaptation in office with Trial B also produced an IAET at near. Trial A was finalized for full time wear, and +2.00 at near in a progressive was prescribed to manage the AET.

Figure 1: Patient's AET; images demonstrate variable nature of eye turn at near



	Dual Focus	Center Distance	Extended depth of focus
Distance Zone	1.00mm undercorrection	1.5mm-1.6mm undercorrection	No distance zone
Mid-peripheral change in power	Sharp increase in plus at 1.0-2.0mm Max power: 2.50D steep fall off	1.4mm-2mm increase in plus power giving near add (less than +2.50 labeling)	Center to 2.7mm: plus increases rapidly and spikes at 2.7 mm
Peripheral change in power	2.00-3.00mm-sharp increase in minus (over-correction) sharp increase in plus	2mm-4mm: plus gradually increases, maintained, or decreases: -1.00D lens: gradual increase in plus -2.00D to -3.00D lens: maintained plus <-3.00D lens: reduction in plus especially with 6.00D	2.7 mm-3.0mm-sharp decrease in plus power giving overcorrection 1.00D-2.00D: power maintained <-2.00D: reduction in plus
Overall Add Power	Unknown behavior with other powers	Maximum add power lower for high powers	Maximum add power lower for high powers

Figure 2: Radial power profiles of SCLM (left to right): Dual focus (omafilcon A), Center D (comfilcon A); extended depth of focus (etafilcon A)

Discussion

Our patient has IAET. Evaluation of the eye turn was challenging because the patient would relax his accommodation and the eye turn would not manifest except with a small accommodative target. Careful evaluation of the binocular system is critical prior to initiating any myopia management strategy in order to maximize binocularity and avoid treatment that could result in decompensation.

For example, initiating atropine could have resulted in a decompensation of the patient's ET to a constant eye turn. It is postulated that atropine can lead to decompensation due to a decrease in the effort of fusional divergence or increased convergence accommodation[2].

An alternative treatment is orthokeratology. It has been shown that binocular vision is left unchanged after treatment with ortho-K lenses; however, the accuracy of the accommodative system improves[3]. Due to the minimal impact on the accommodative system, this modality is unlikely to control our patient's AET.

The patient was fit in a SCLM. Exophoria often increases with contact lens wear. Our patient initially showed a reduction in ET to exophoric alignment. However, after his two-week follow-up, the patient showed increased ET at near than what was previously seen. We hypothesize the patient could previously have been sacrificing clarity at near in order to reduce diplopia. With the CLs trialed, the patient is no longer able to trade clarity for decreased diplopia, leading to an increase in esotropia. This can be due to the design of the contact lens and how the add power is dispersed throughout the lens. Additionally, higher refractive errors may not receive the full intended add in SCLM[4,5,6] (figure 2). Despite the unknown mechanism leading to increased ET in our patient, it was deemed he would need +2.00D reading spectacles to improve binocularity and comfort at near, in addition to SCLM prescribed for myopia control. Further research is needed to investigate how multifocal lens designs interact with the vergence and accommodative system.

Conclusion

All SCLMs trialed were equal in improving BV in AET initially. However, at subsequent visits, the patient's ET manifested and +2.00D readers at near were necessary. Clinicians must consider individual fitting parameters that will produce the best vision and comfort. Low dose atropine for myopia management is linked to increased eso and may result in decompensation of the near angle. This case highlights the importance of careful evaluation of BV prior to selecting myopia treatment.

References

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