



Management of myopia and meridional amblyopia with multifocal toric soft contact lenses

Franklin Bui OD, Xiaoying Zhu OD PhD FAO

STATE UNIVERSITY OF NEW YORK
COLLEGE OF OPTOMETRY

BACKGROUND

Myopia:

- The prevalence of myopia is rapidly increasing worldwide
- Recent therapeutic strategies for myopia control include: Orthokeratology lenses, low-dose atropine ophthalmic drops, and multifocal soft contact lenses^{1,2}, all of which delay progression by approximately 50%^{1*}
- The latter option was demonstrated to be effective in individuals with spherical refractive myopia²; however, no study has been published to date regarding the efficacy of multifocal toric soft contact lenses and myopic individuals with high regular astigmatism

Amblyopia:

- The prevalence of amblyopia in the general population is 2% and affects boys and girls equally^{3,4}
- Uncorrected high astigmatism can lead to meridional amblyopia and result in abnormal development of the visual pathway and visual cortex³
- Treatment for amblyopia includes: refractive correction, patching, pharmacologic penalization, and vision therapy³
- Contact lenses can also provide visual correction.^{5,6}

Purpose:

This case explores a patient who presents with progressing myopia and bilateral meridional amblyopia, and illustrates a successful treatment and management of both conditions with multifocal toric soft contact lenses.

PATIENT HISTORY

- A 13-year-old Hispanic male with bilateral meridional amblyopia presented for a myopia control evaluation
- BCVA with spectacles: 20/30 OD and 20/30 OS

Previous refractions (prior to initial visit):

Visits	OD	OS
1 Year Prior	-1.25 -3.50 x178	-2.25 -3.50 x015
1 Month Prior	-2.25 -3.75 x180	-3.25 -3.75 x010

CLINICAL FINDINGS

Chief complaint	Distance blur OU, progressing from 1 year ago	
Ocular history	Wore glasses since 5 years old (+) history of patching, 4 years	
Medical history	Unremarkable	
Ocular medications	None	
Systemic medications	None	
Unaided visual acuity	OD: 20/400 OS: 20/400	
Manifest	OD: -2.25 -3.75 x170 OS: -3.25 -3.75 x015	VA 20/30 VA 20/30
Distance Cover Test	orthophoria	
Near Cover Test	4 ^Δ exophoria	
Stereoacuity	Randot stereo: 250 arc sec Wirt circles: 70 arc sec	
Anterior segment	1+ papillae OD/OS Clear cornea OD/OS	
Posterior segment	Pink and healthy, C/D 0.30H/0.30V OD/OS Macula flat and intact OD/OS Lattice degeneration OD	

CORNEAL TOPOGRAPHY IMAGES – ZEISS ATLAS

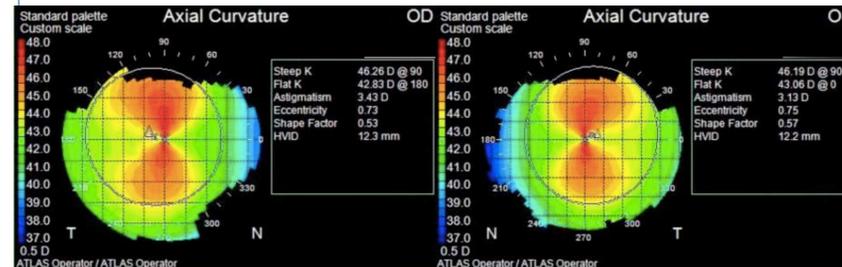


Figure 1. Topography maps reveal with-the-rule regular astigmatism of the right and left eye

TREATMENT & MANAGEMENT

Parameters	OD	OS
Lens Brand	CooperVision Proclear Multifocal Toric	
Design	Center Distance	
Base curve (mm)	8.8	
Diameter (mm)	14.40	
Power (D)	-2.50 -3.25 x170	-2.75 -3.25 x015
Add (D)	+2.00	+2.00

Assessment	OD	OS
Distance acuity	20/20	20/25
Near acuity	20/20	20/20
Spherical over-refraction	Plano	Plano
Centration	Centered	Centered
Movement	0.5 mm	0.5 mm
Coverage	Full limbal	Full limbal
Rotation	0 degrees	0 degrees

AXIAL LENGTH – HAAG STREIT LENSTAR OPTICAL BIOMETER

Visits	OD	OS
Initial	24.26 mm	24.59 mm
9 months	24.24 mm	24.59 mm
15 months	24.28 mm	24.60 mm

AUTOREFRACTION - GRAND SEIKO WAM-5500

Visits	OD	OS
Initial	-2.75 -3.00 x006	-3.25 -3.25 x008
9 months	-2.50 -3.50 x175	-3.25 -3.25 x005
15 months	-2.50 -3.75 x179	-3.25 -3.50 x006

DISCUSSION

Myopia:

- Myopia is one of the most prevalent disorders of the eye, and is the sixth leading cause of vision loss worldwide⁷
- Myopia increases the risk of ocular complications such as maculopathy, glaucoma, cataracts, and retinal detachment⁸⁻¹⁰
- Myopia increases in the axial length of the eye, which increases the risk of visual impairment as individuals get older¹¹

Amblyopia:

- Individuals with amblyopia carry a projected lifetime risk of visual loss of at least 1.2%³
- Isoametropic amblyopia, though an uncommon form of amblyopia, accounts for 1-2% of all refractive amblyopia¹². Astigmatism greater than 2.50D is one cause of isoametropic amblyopia³
- Correction of refractive error alone has been shown to treat or significantly reduce amblyopia³

Management:

- Management of myopia includes multifocal soft contact lenses^{1,2}
- The leading theory behind its efficacy is the induction of peripheral myopic defocus, which in turn, signals the halt in axial elongation.^{13,14}
- Several studies have been published regarding the efficacy of multifocal soft contact lenses in retarding myopia progression¹. There has yet to be a study regarding the efficacy of a toric multifocal soft lens. Given that the lens design is similar to spherical power multifocal lenses, the efficacy may also be similar
- Monitoring of myopia progression should include refractive error and axial length measurements.

CONCLUSION

- This case demonstrated that multifocal toric soft contact lenses can both slow down myopia progression and improve an amblyopic patient's visual acuity.
- Patients with progressing myopia should be monitored every six months with follow-up visits that include visual acuity measurements, refraction, corneal health check, contact lens assessment, and axial length measurements.
- Multifocal toric soft contact lenses may be a consideration for managing myopia in individuals with high astigmatism, demonstrating potential success similar to spherical power multifocal soft contact lenses, orthokeratology lenses, and atropine eye drops.
- Future studies are needed to further evaluate the effect of multifocal toric soft contact lenses on amblyopia treatment.

REFERENCES

- Walline JJ. Myopia Control: A Review. *Eye Contact Lens*. 2016 Jan;42(1):3-8.
- Walline JJ, Greiner K, McVey M, et al. Multifocal contact lens myopia control. *Optom Vis Sci*. 2013 Nov;90(11):1207-14
- American Optometric Association. Care of the Patient with Amblyopia. *Opt Clin Prac Guidelines*. 2004
- Webber AL, Wood J. Amblyopia: prevalence, natural history, functional effects and treatment. *Clin Exp Optom*. 2005 Nov;88(6):365-75.
- Wang B, Naidu R, Qu X. The use of rigid gas permeable contact lenses in children with myopia amblyopia: A case series. *Cont Lens Anterior Eye*. 2018 Apr;41(2):224-8.
- Roberts CJ, Adams GG. Contact lenses in the management of high anisometropic amblyopia. *Eye (Lond)*. 2002 Sep;16(5):577-9.
- Dolgin E. The myopia boom. *Nature*. 2015;519(7543):276-8.
- Flitcroft DI. The complex interactions of retinal, optical and environmental factors in myopia aetiology. *Prog Retin Eye Res*. 2012;31(6):622-60.
- Younan C, Mitchell P, Cumming RG, et al. Myopia and incident cataract and cataract surgery: the Blue Mountains Eye Study. *Invest Ophthalmol Vis Sci*. 2002;43:3625-32.
- Ogawa A, Tanaka M. The relationship between refractive errors and retinal detachment – analysis of 1166 retinal detachment cases. *Jpn J Ophthalmol*. 1988;32:310-5.
- Tideman JW, Snabel MC, Tedja MS, et al. Association of Axial Length With Risk of Uncorrectable Visual Impairment for Europeans With Myopia. *JAMA Ophthalmol*. 2016;134(12):1355-63.
- Amos JF. Refractive amblyopia. In: Amos JF, ed. *Diagnosis and management in vision care*. Boston: Butterworths, 1987:369-408.
- Benavente-Perez A, Nour A, Troilo D. Axial eye growth and refractive error development can be modified by exposing the peripheral retina to myopic or hyperopic defocus. *Invest Ophthalmol Vis Sci*. 2014 Sep;55(10):6765-73.
- Bernsten DA, Kramer CE. Peripheral defocus with spherical and multifocal soft contact lenses. *Optom Vis Sci*. 2013 Nov;90(11):1215-24.

*Disclosure: all myopia control strategies are not FDA-approved and considered off-label treatment