


Empirically Fit Translimbal Orthokeratology for the Management of High Myopia

6/6/26

Presented by: Sharon Qiu, OD, MS, FAAO, FSLC



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1

Disclosures

- BostonSight: received educational honoraria in the past 3 years
- CooperVision: received travel reimbursement in the past 3 years

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2

Background – Myopia as a Public Health Problem

- Prevalence of myopia is on the rise worldwide
 - IMI: **34%** of the world's population is myopic in 2019¹
 - Prediction: **50%** of the world's population will be myopic in 2050²
- Myopia is a costly burden to society and to the individuals affected
 - Uncorrected RE → **202 billion** dollars economic loss³
- Associated with **ocular pathology**: early cataract formation, POAG, retinal detachment, myopic macular degeneration¹
 - Risk increases significantly above -6.00 D (**high myopia**)

1. Steinberg P, Taylor N, Khandaj H, Naderi-Gilani T, Zou H, Frick KD, Marmarouk S, Pruthi DS, Lammertsen K, Koefoed J, Walline JJ, Frisby TA, Koozi V, Rosenkoff S. The Impact of Myopia. Invest Ophthalmol Vis Sci. 2020; 61(16):4622-30. doi: 10.1167/iovs.61.16.4622. PMID: 32999298. PMCID: PMC7402476.

2. Holden BA, Frisby TA, Wilson DA, Jiang H, Naderi-Gilani T, Wang YQ, Naderi-Gilani T, Bamford T. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 to 2050. Ophthalmology. 2022; Mar 15; 130(3):539-549. doi: 10.1016/j.ophtha.2021.11.016. Epub 2021 Nov 15. PMID: 34949200.

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3

Background

- Conventional myopia management strategies:
 - Low-dose atropine
 - 0.01%, 0.025% and 0.05%¹
 - Myopia management spectacle glasses
 - Up to -13.00 DS, -4.00 cyl
 - Myopia management soft contact lenses
 - Daily: Up to -10.00 or -12.25 DS (off-label multifocal soft contact lenses), no toric option available
 - Monthly: off-label multifocal soft contact lenses, up to -10.00 DS, -5.75 cyl
 - Orthokeratology (ortho-k):
 - FDA approval: up to -6.00 DS, -1.75 D cyl

¹ Yam JC, Jiang Y, Tang SM, Low AKP, Chan JJ, Wong E, Ko ST, Young AL, Tham CC, Chen LJ, Pang CP. Low Concentration Atropine for Myopia Progression (LAMPP) Study: A Randomized, Double-Blinded, Placebo-Controlled Trial of 0.05%, 0.025%, and 0.01% Atropine Eye Drops in Myopia Control. *Ophthalmology*. 2019;126(11):2814-2821. doi: 10.1016/j.ophtha.2018.05.039. Epub 2018 Jul 6. PMID: 30214760

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4

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5

Case History

- 15-year-old Caucasian male, followed at the University of Waterloo's Advanced Contact Lens Service since 2021.
 - Myopia onset at 5 yo per mother
 - Two highly myopic parents, mother has a h/o RD
- History of myopia management
 - Initial management (2021 - 2022): myopia management glasses with 0.05% atropine QHS OU, but axial length increased 0.40 mm OU over one year, and SE increased 0.75 D OU over one year
 - 2022 - 2023: Therapy was changed to myopia management SCLs with 0.05% atropine, yet axial length again increased 0.40 mm OU, and SE increased 1.00 D OU over one year
 - 2023 - 2024: Higher concentrations of atropine were trialed (0.10% QHS OU and an off-label 1% atropine protocol), but 0.40 mm OU progression occurred between 2023-2024, and SE increased 1.00 D OU over one year

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6

Attempt #2 – Translimbal Ortho-k

- **Translimbal ortho-k:** a large-diameter ortho-k lens designed to extend just beyond the limbus
 - A larger alignment zone helps improve lens centration and stability
 - The edge is lifted over the limbal region to minimize interaction with limbal stem cells and enhance tear exchange



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10

Attempt #2 – Translimbal Ortho-k

- **Diagnostic fitting:** selecting lens parameters after assessing the fit of a diagnostic lens on the eye!
- **Empirical fitting:** selecting lens parameters based only on captured data and theoretical models!
 - **Advantages of empirical fitting**
 - Optimized lens parameters that are true to the shape of the eye
 - fewer lens revisions
 - Reduced chair time with higher first lens success rate
 - Increased patient satisfaction
 - **Disadvantages of empirical fitting**
 - Cost: equipment and ortho-k lenses

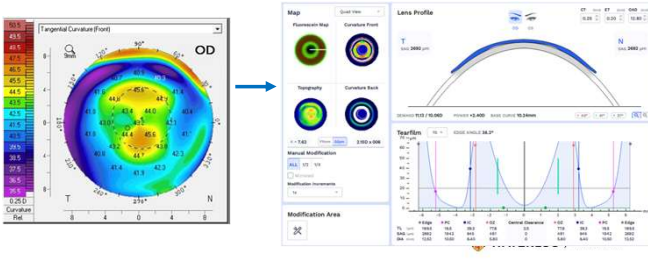


Learning curve
 1. Michael L. Bartalucci, C. Thomas A. Karwowski P. Empirical fitting of soft or rigid gas-permeable contact lenses for the correction of moderate to severe refractive astigmatism. *Optometry*, 2006, 76(10):37-43
 2. Samuel M. Quaresima, PhD, D. Lee K. Michael L. Montanari, C. van der Worp R. Vincent M. Walker M. Billa P. Morgan PR. CLEAR - School of Optometry. *Contact Lens Anterior Eye*, 2013, 37(4):217-208.

11

Attempt #2 – Translimbal Ortho-k

- **Required information:** topography scan, subjective refraction, HVID, and target Jessen factor



12

Attempt #2 – Translimbal Ortho-k

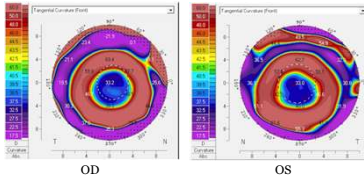
- **Lens parameters at the end of the warranty period**
 - OD: 10.24 / 12.80 / +2.42 / Boston XO2
 - OS: 10.07 / 12.70 / +2.40 / Boston XO2
- **Unaided VA at 4pm**
 - OD: 20/20
 - OS: 20/20-



13

Attempt #2 – Translimbal Ortho-k

- **Subjective refraction** **“I wish I had known about ortho-k as an option earlier!”**
 - OD: +1.50 20/20-
 - OS: +0.50 20/20-
- **Corneal tomography**
 - OD & OS: bull’s eye complete and centered
- **Slit lamp examination**
 - OD & OS: minimal corneal staining
- **Axial length increase:** 0.30 mm OU first year of ortho-k wear



14

Discussion

- **Evidence for myopia management in high myopia > -6.00 DS:**

Home > Ophthalmic and Physiological Optics > Article

High myopia: Reviews of myopia control strategies and myopia complications

Review Article | Open access | Published: 08 August 2024

Volume 44, pages 1248–1260, (2024) [Cite this article](#)



15

Discussion

- **Evidence for myopia management in high myopia > -6.00 DS¹:**
 - **Limited studies in general:** ~12 studies included high myopia patients at least partially in the design
 - **Atropine:** studies used 0.01%, 0.5% and 1% atropine
 - Higher dose atropine (0.5% and 1%) was more effective than 0.01% atropine, but also higher incidence of side effects

¹ Shah R, Yooak N, Evans R.W. High myopia: Review of myopia control strategies and myopia complications. *Ophthalmic Physiol Opt.* 2024;44(6):1248-1260. doi: 10.1016/j.pri.2024.04.011. PMID: 39081327.



16

Discussion

- **Evidence for myopia management in high myopia > -6.00 DS¹:**
 - **Myopia management spectacles:** decreasing efficacy of DIMS spectacle lenses with increasing levels of myopia
 - Retrospective data only
 - **Ortho-k:**
 - Ortho-K appeared to have a similar effectiveness in slowing axial elongation with full correction and in cases where there was partial correction
 - Higher rates of corneal fluorescein staining with full correction

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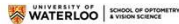


17

Discussion

- “Based on the best available evidence, topical antimuscarinic agents and orthokeratology appear to be the most effective interventions in slowing childhood myopia progression in high myopia. Further work is necessary regarding Ortho-K as a myopia control option in young children (age 5–9 years) with moderate or high myopia independently or as a combination treatment with atropine or myopia control spectacle lenses.”⁷¹
- “The priority following the initial diagnosis of high myopia in childhood is to exclude a medical diagnosis (indicating secondary myopia) that could be of greater overall importance to the child's health.”⁷¹

¹ Shah R, Yooak N, Evans R.W. High myopia: Review of myopia control strategies and myopia complications. *Ophthalmic Physiol Opt.* 2024;44(6):1248-1260. doi: 10.1016/j.pri.2024.04.011. PMID: 39081327.



18

Conclusions

- Translimal ortho-k design may provide better lens centration to improve visual outcomes
- Although not typically considered for high myopia, empirically fit translimal ortho-k lenses may provide effective myopia correction and functional vision in select pediatric patients and should be considered when conventional treatments fail to provide adequate control of myopia progression.
 - Combination therapy with low-dose atropine may provide additional benefit in slowing myopia progression
- Further research is needed to evaluate the long-term efficacy and safety of different strategies in pediatric high myopia management



19

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20

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THANK YOU! ANY QUESTIONS?
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21
