

Seeing clearly without glasses:

Orthokeratology lenses (OKL) reduce myopic progression in Danish children



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On March 12, 2021, Trine Møldrup Jakobsen defended her thesis, “Orthokeratology Lenses for Myopia Control in Scandinavian Children: A randomised 18-month clinical trial” at the Department of Regional Health Research, Faculty of Health Sciences, University of Southern Denmark. The PhD project was conducted at the Dept. of Ophthalmology, Vejle Hospital. Associate Professor Flemming Møller, Department of Ophthalmology, Vejle Hospital was the main supervisor, with co-supervisors Anders Peter Søndergaard, MD, PhD, Dept. of Ophthalmology, Vejle Hospital, and Professor Birgitte Nørgaard, Dept. of Public Health, University of Southern Denmark.

Introduction

The prevalence of myopia (near-sightedness) is increasing worldwide, and rates over 90% have been reported in Asia. In Denmark, the prevalence of myopia has increased from 13% in 2007 to 25% in 2020. This increase is worrying because of the sight-threatening conditions associated with high degrees of myopia such as retinal detachment, macular atrophy, and macular neovascularization.



Figure 1. Orthokeratology lenses are custom-fitted, rigid, gas-permeable contact lenses that are used every night during sleep. They induce a temporary flattening of the central cornea, thus reducing or eliminating the need for myopia correction after removal.

Methods

This 1:1 randomized controlled trial investigated the efficacy of myopia control and the safety of orthokeratology (ortho-k) lenses in Scandinavian children, with a control group using single-vision spectacles. The participants were 60 myopic, ethnically Danish children aged 6 to 12 years with myopia of 0.5 to 4.75 diopters spherical and up to 2.5 D regular astigmatism in both eyes. For secondary outcomes, we investigated the association between baseline relative

Key points:

- Orthokeratology lenses reduced eye growth in myopic Danish children.
- The efficacy was similar for Danish children as for other ethnic populations.
- There were no treatment-requiring or sight-threatening adverse events during the 18 months follow-up period.

peripheral refractive error and myopia progression in both groups, the change in relative peripheral refractive error in the ortho-k group and its association with treatment efficacy, and the correlation between cycloplegic spherical equivalent refractive error (SEQ) and axial growth to relate the results to clinical assessments for myopic patients.

Results

Axial growth was significantly smaller in the ortho-k group compared to the single-vision spectacles group at all follow-up visits. No treatment-requiring or vision-threatening adverse events occurred during the study. The relative peripheral refractive error changed significantly from baseline to the 6-month follow-up in the ortho-k group. The baseline relative peripheral refractive error was not correlated to axial growth in either group. The initial change in relative peripheral refractive error was not correlated to the myopia control effect of the ortho-k lenses. In the single-vision spectacles group, the correlation between changes in SEQ and axial length at 12-month follow-up was

1 D = 0.55 mm for all participants, 0.60 mm for males, and 0.53mm for females. The correlation was higher in Danes compared to other ethnic groups.

Conclusion

Ortho-k lenses effectively reduced the progression of myopia without adverse events. We found that ortho-k lenses induced relative peripheral myopic defocus, which may contribute to the altered axial elongation. However, neither the degree of relative peripheral refractive error change (ortho-k group) nor the baseline relative peripheral refractive error was associated with the myopic progression. Finally, we estimated the correlation between changes in SEQ and axial length,

which can be used when monitoring myopic progression in Danish ortho-k patients in a clinical setting.

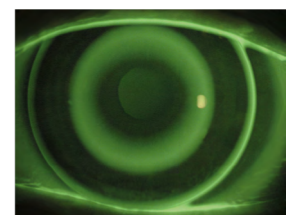


Figure 2. The fit of an orthokeratology lens with fluorescein instilled

Remaining questions:

- Can individual treatment efficacy be predicted by short term changes in choroidal thickness or higher order aberrations?
- Are spectacle lenses with peripheral defocus as efficient as orthokeratology lenses for myopia control?
- Can therapies be combined for an additive effect?

References

1. Jakobsen TM, et al. Control of myopia using orthokeratology lenses in Scandinavian children aged 6 to 12 years. Eighteen-month data from the Danish Randomized Study: Clinical study Of Near-sightedness; Treatment with Orthokeratology Lenses (CONTROL study). *Acta Ophthalmol.* 2022;100(2):175-182.
2. Jakobsen TM, et al. Peripheral refraction, relative peripheral refraction, and axial growth: 18-month data from the randomised study-Clinical study Of Near-sightedness; Treatment with Orthokeratology Lenses (CONTROL study). *Acta Ophthalmol.* 2022. doi: 10.1111/aos.15217.
3. Jakobsen TM, et al. Correlation between change in cycloplegic spherical equivalent refractive error and change in axial length in Danish children aged 6 to 12 year. *Acta Ophthalmol.* 202;99(7):e1249-e1250.