Understanding Myopia and Its Long-Term Effects

Myopia: Beyond Vision Correction - Addressing the Disease

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Disclosure Statement

I am a paid consultant for:

- Alcon
- Bruno Vision
- CooperVision
- Dopavision
- EssilorLuxottica
- Euclid Vision
- Eyenovia
- Genentech
- Johnson & Johnson
- Kubota Vision
- Sydnexis
- Vyluma

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Why Myopia?
Why Now?

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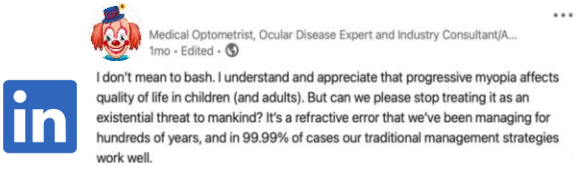
What's the Big Deal?



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Why Myopia? Why Now?

- Increasing prevalence
- Better understanding of role in visual impairment
- Ability to do something about it

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Three long-term benefits of lowering young patient's ultimate level of myopia:

- Better vision when uncorrected *and* corrected
- Better options for, and outcomes from, surgical myopia correction
- Reduced risk of visual impairment associated with higher levels of myopia


CLINICAL PERSPECTIVE

Myopia Control: Why Each Diopter Matters

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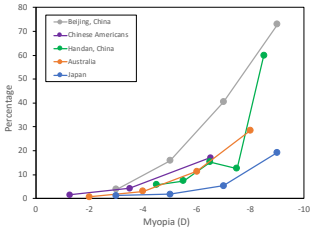
Prevalence of Myopic Maculopathy


CLINICAL PERSPECTIVE

Myopia Control: Why Each Diopter Matters



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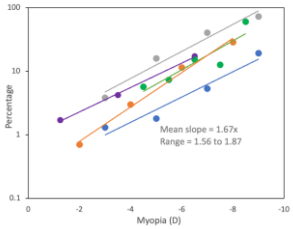
Prevalence of Myopic Maculopathy


CLINICAL PERSPECTIVE

Myopia Control: Why Each Diopter Matters



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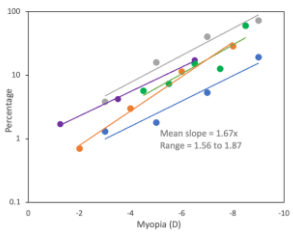
Prevalence of Myopic Maculopathy

Each additional diopter increases risk by 67% (= 1.67 – 1)



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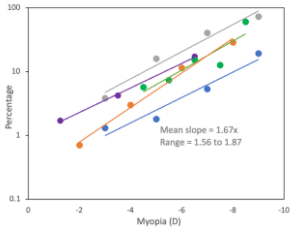
Prevalence of Myopic Maculopathy

Each additional diopter increases risk by 67%
(= 1.67 – 1)

Each diopter less, reduces risk by 40%
(= $1 - {}^{1}/_{1.67}$)



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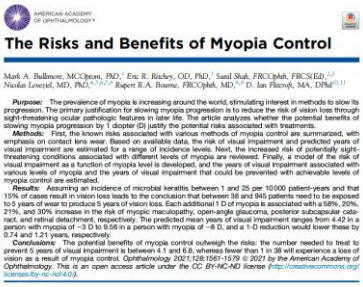

The Risks and Benefits of Myopia Control

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Purpose: The prevalence of myopia is increasing around the world, stimulating interest in methods to slow its progression. The primary justification for slowing myopia progression is to reduce the risk of vision loss through sight-threatening ocular pathologic features in later life. The article analyzes whether the potential benefits of slowing myopia progression by 1 diopter (D) justify the potential risks associated with treatments.

Methods: First, the known risks associated with various methods of myopia control are summarized, with emphasis on contact lens wear. Based on available data, the risk of visual impairment and predicted years of visual impairment are estimated for a range of incidence levels. Next, the increased risk of potentially sight-threatening conditions associated with different levels of myopia are reviewed. Finally, a model of the risk of visual impairment as a function of myopia level is developed, and the years of visual impairment associated with various levels of myopia and the years of visual impairment that could be prevented with achievable levels of myopia control are estimated.

Results: Assuming an incidence of microbial keratitis between 1 and 25 per 10 000 patient-years and that 15% of cases result in vision loss leads to the conclusion that between 38 and 945 patients need to be exposed to 5 years of wear to produce 5 years of vision loss. Each additional 1 D of myopia is associated with a 58%, 20%, 21%, and 30% increase in the risk of myopic maculopathy, open-angle glaucoma, posterior subcapsular cataract, and retinal detachment, respectively. The predicted mean years of visual impairment ranges from 4.42 in a person with myopia of −3 D to 9.56 in a person with myopia of −8 D, and a 1-D reduction would lower these by 0.74 and 1.21 years, respectively.

Conclusions: The potential benefits of myopia control outweigh the risks: the number needed to treat to prevent 5 years of visual impairment is between 4.1 and 6.8, whereas fewer than 1 in 38 will experience a loss of vision as a result of myopia control. *Ophthalmology 2021;128:1561–1579 © 2021 by the American Academy of Ophthalmology. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).*

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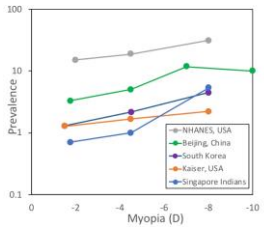
Prevalence of Open-Angle Glaucoma

Each diopter increases risk by 20%



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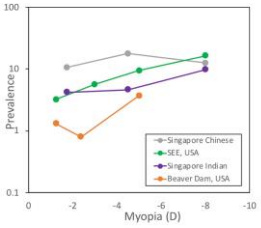
Prevalence of Posterior Subcapsular Cataract

Each diopter increases risk by 21%



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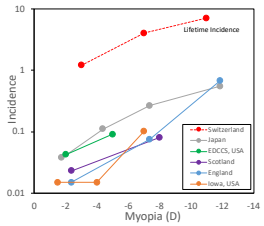
Incidence of Retinal Detachment

Each diopter increases risk by 30%



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Visual Impairment and Myopia

- Population-based data
  - Rotterdam Study I (1990–3), II (2000–2), and III (2006–8)
  - Erasmus Rucphen Family Study (2002 to 2005)
  - Myopia case-control Study (2010 to 2012)
- 15,404 individuals with spherical equivalent data
- 9,074 individuals with axial length data


Association of Axial Length With Risk of Uncorrectable Visual Impairment for Europeans With Myopia

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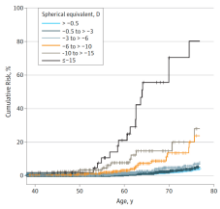
Visual Impairment and Myopia



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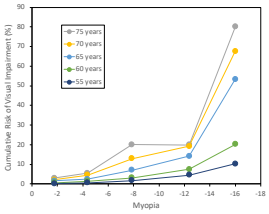
Visual Impairment and Myopia



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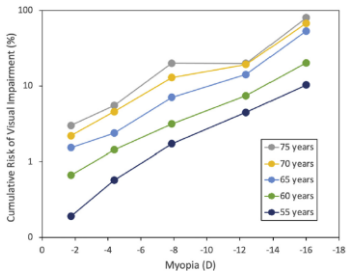
Visual Impairment and Myopia

Each diopter increases visual impairment by 30% (= 1.30 – 1)

Each diopter less, reduces visual impairment by 25% (= 1 – $^{1}/_{1.30}$)



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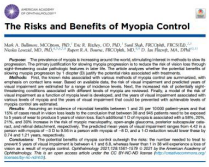
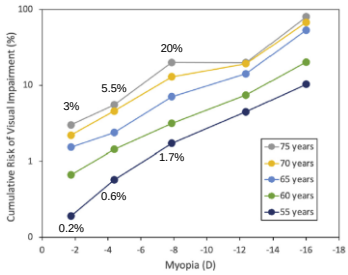
Relative Risk vs. Absolute Risk (6/20 or worse)


The Risks and Benefits of Myopia Control



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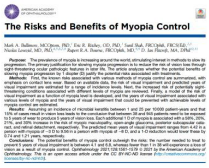
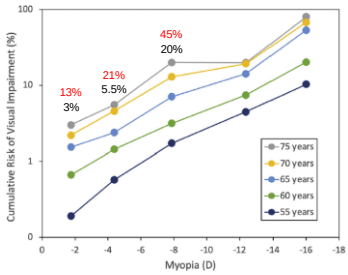
Relative Risk vs. Absolute Risk (6/12 or worse)


The Risks and Benefits of Myopia Control



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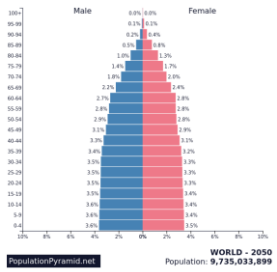
World Population in 2050



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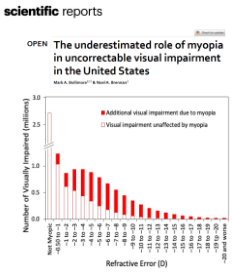
Global Visual Impairment and Myopia in 2050

- Myopia Prevalence 50%
- Total Visual Impairment 307 million
- Attributable to Myopia 109 million (35%)

Prevented by 1 D of control:

- –6 D or worse 12 million
- –3 D or worse 27 million
- –1D or worse 44 million



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Summary

- One third of all visual impairment attributable to myopia
- Each diopter increases risk of myopic maculopathy by 60%
- Each diopter increases risk of glaucoma by 20%
- Each diopter increases risk of visual impairment by 30%
- Would take less than a diopter of control to prevent one million cases of visual impairment in US
- Benefits of myopia control far outweigh risks

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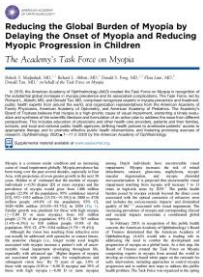
Summary

- Myopia is a major contributor to global visual impairment
- We should continue our efforts to prevent myopia and slow its progression

"although higher degrees of myopia carry a greater risk of visual impairment to the individual, the population-based burden of lower degrees of myopia remains considerable"



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