

## Not All Myopia Needs Control

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**This presentation is intended to discuss all the information regarding myopia management, but to also discuss if we are going overboard with implementation. Do we really have an epidemic of myopia? Is myopia a chronic disease as some are describing it? Are there children that do not need myopia management and who are they?**

### I. Introduction

#### A. Definition and epidemiology

1. Global prevalence trends (exponential rise in East Asia; increasing in Western countries)
2. Projected burden by 2050 ( $\geq 50\%$  global prevalence;  $\sim 10\%$  high myopia)

#### B. Public health significance

#### C. What is an epidemic.

1. Economic burden (lost productivity, healthcare utilization)
2. Vision-threatening sequelae  $\rightarrow$  glaucoma, cataract, myopic maculopathy, retinal detachment

#### C. Pathophysiologic paradigm shift

1. From refractive condition to **progressive ocular disease**
2. Importance of early intervention and longitudinal control strategies

#### D. Epidemiology and data on rates of myopia related disease?

Myopic macular degeneration

Retinal detachment

Cataracts

Glaucoma

### II. Pathophysiology and Mechanisms of Myopia Development

#### A. Ocular axial elongation as primary driver

#### B. Structural and cellular changes

1. Scleral remodeling, extracellular matrix changes
2. Choroidal thinning and perfusion abnormalities

#### C. Genetic determinants

1. Polygenic risk; GWAS findings; familial aggregation
2. Genetic-environment interaction models
- D. Environmental and behavioral determinants
  1. Reduced outdoor light exposure (dopaminergic retinal signaling)
  2. Near work intensity and accommodative lag / hyperopic retinal defocus
  3. Digital device time, sustained near focus, limited dynamic focus ranges
- E. Neuro-ophthalmic considerations
  1. Visual processing adaptation to myopic blur
  2. Retinal signaling pathways in axial elongation

### **III. Natural History and Clinical Classification**

- A. Age-related onset and risk windows
- B. Refractive vs. pathological myopia
  1. Low, moderate, high, and **pathologic** myopia definitions
  2. Myopic maculopathy classification (META-PM)
- C. Rapid progression phenotypes
- D. Risk factors for accelerated axial elongation

### **IV. Clinical Evaluation for Myopia Management**

- A. Comprehensive exam and baseline metrics
  1. Cycloplegic refraction (gold standard)
  2. Axial length measurement (optical biometry)
  3. Keratometry, corneal tomography/biomechanics
- B. Ocular anatomy and retinal imaging
  1. OCT macula, ONH
  2. Fundus photography / wide-field imaging
- C. Binocular vision assessment
  1. Accommodative function, lag, facility
  2. Vergence function, phoria, AC/A ratio
- D. Lifestyle and environmental risk assessment
- E. Growth charts and prediction models
  1. Axial length percentile curves
  2. Progression calculators (BHVI, IMI, Brien Holden)

### **V. Evidence-Based Interventions**

#### **A. Optical Interventions**

1. Orthokeratology (OK)
  - a. Peripheral myopic defocus mechanism

- b. Efficacy, axial length outcomes, rebound risk
- 2. Multifocal soft contact lenses (center-distance designs)
  - a. Commercial data (MiSight FDA, etc.)
  - b. Add-power considerations, pupil size effect
- 3. Specialty spectacles
  - a. Defocus-incorporated multiple segment lenses (DIMS)
  - b. Aspherical lenslets designs
  - c. Evidence and age-linked prescribing
  - d. Essilor Stellaris lens impact on the market

## **B. Pharmacologic Interventions**

- 1. Atropine therapy
  - a. Mechanism (retinal/muscarinic pathways, scleral remodeling)
  - b. Concentrations (0.01–0.05% evidence gradient)
  - c. Rebound phenomena and tapering strategies
- 2. Combination therapies (Atropine + OK or other optical modalities)
- 3. Sydnexis FDA rejection

## **C. Behavioral and Environmental Interventions**

- 1. Outdoor exposure prescriptions ( $\geq 2$  hours/day)
- 2. Near-work hygiene, 20-20-2 & accommodative breaks
- 3. Digital device ergonomics & educational modifications

## **D. Emerging and Experimental Therapies**

- 1. Dopaminergic modulation, red-light therapy evidence
- 2. Novel optical technologies (wavefront-guided, adaptive optics)
- 3. Gene and biomechanical therapies under investigation

## **VI. Clinical Decision-Making Framework**

- A. Risk stratification models
- B. Treatment selection algorithms
  - 1. Age of onset
  - 2. Rate of progression (diopters + axial length)
  - 3. Binocular vision status and corneal parameters
- C. Shared decision-making
  - 1. Pediatric patient engagement strategies
  - 2. Parent education and informed consent considerations
- D. Follow-up schedule and clinical monitoring
  - 1. Optical and pharmacologic therapy cadence

2. Safety surveillance (corneal health, IOP, retinal exams)
3. Axial length monitoring frequency

## **VII. Public Health, Ethical, and Policy Considerations**

- A. Myopia as a global health priority (WHO, IMI)
- B. Health equity and access disparities
- C. Regulatory environment (FDA clearances, international standards)
- D. Ethical considerations in pediatric intervention
- E. Role of schools, pediatricians, optometrists, ophthalmologists, public health systems

## **VIII. Future Directions**

- A. Artificial intelligence and predictive analytics
- B. Next-generation pharmacologic agents
- C. Retinal imaging biomarkers for early prediction
- D. Population-level prevention strategies
- E. Myopia control in high-risk and special populations

## **IX. Conclusion**

- A. Shift from refractive correction to **disease modification**
- B. Multi-modal, evidence-based, individualized care
- C. Necessity of interdisciplinary collaboration and early detection
- D. Lifelong monitoring for high myopes