Progressive myopia in children:
What Pediatricians/Family Physicians/School Nurses should know

What is Myopia?

Myopia, also known as near-sightedness, is a condition where a child can see nearby objects clearly, but distant objects look blurry. It happens usually when the eye grows too long from front to back, which is also called axial elongation. This causes incoming light rays to focus in front of the retina instead of directly on it. Myopia can also occur due to abnormalities in the lens and cornea. Myopia usually begins in childhood and tends to get worse, or progress, as a child grows. Many children can have a combination of myopia and astigmatism.

Why Does Myopia Matter?

- According to the largest observational study published to date, myopia now affects approximately one-third of children globally, and this figure is projected to continue to increase significantly in the coming years, to over 740 million cases by 2050.[1] The American Academy of Ophthalmology (AAO) has reported that the estimated prevalence of myopia in North America in 2020 is 42.1%, and it is predicted to increase to 58.4% by 2050.[2]
- Uncorrected myopia will cause blurry distance vision which can affect school performance, ability to participate in sports, confidence, and even long-term visual development.
- Myopia increases the risk of ocular complications. Even moderate myopia (-3 Diopters or higher) is associated with higher lifelong risks of retinal detachments, glaucoma, and cataracts. High myopia is when the glasses prescription increases above -6.0 Diopters or higher and has been found to be associated with a 20 times higher risk of retinal detachments along with glaucoma, early cataracts and myopic degeneration. These risks of future myopic complications do not go away if the child goes on to get LASIK or other refractive surgeries later in life because the heightened risks are due to the axial elongation, not due to the direct need for eyeglasses.

How Do We Treat Myopia?

Children with myopia need eyeglasses or contact lenses to help them see clearly in the distance. Refractive surgeries such as LASIK are not options for children because their eyes are still growing.

How Can We Slow Myopia Progression?

While myopia cannot usually be reversed, there are several strategies that have been shown to slow down its progression and slow axial elongation.

1. **Environmental Changes**
    - Increased Outdoor Time: Many studies have shown that children who spend more time outdoors with exposure to natural light have less myopic progression. [3-5] Children should aim to have at least 2 hours outside per day.
    - Limiting Digital Devices: Increased screen time has also been a potential concerning cause for increase in childhood myopia.[6-9] Children should avoid prolonged screen time for entertainment and should be encouraged to use larger devices held farther away from their eyes and faces (i.e. television on opposite wall would be preferable to a handheld tablet). Ideally at school and at home, children should follow the **20-20-20 rule:** every 20 minutes of near work, look at something 20 feet away for 20 seconds.

2. **Optical Strategies**
    - **Defocus Spectacles**: These spectacles are designed to have a central zone that helps children see better to correct their myopia, but they also have multiple small lens segments in the periphery (edge) of the lenses to create a controlled blur, or defocus, on the peripheral retina. This peripheral defocus has been found to slow progression of myopia and eye growth. The Essilor Stellest spectacles have recently been FDA approved in the United States for slowing myopic progression, and there are other brands available outside the United States that offer similar designs as well.[10-13] Children may not be candidates for these spectacles if their eyeglasses prescription is too high or if they have certain other eye conditions such as strabismus
    - **Dual Focus Soft Contact Lenses**: These are soft contact lenses worn during the day with different focus zones built into the lens designs. The central zone allows good vision and corrects the child's myopia while the outer zones create a peripheral defocus that slows eye growth and myopia progression, similar to the defocus spectacles lenses. MiSight contact lenses by CooperVision are FDA approved daily wear contact lenses for slowing myopic progression and are available in a variety of powers.[14-17] There are also other contact lens brands with similar designs, each with a different range of powers. This may be a good strategy for a child already interested in contact lenses wear.
    - **Orthokeratology ("OrthoK"):** These are special rigid gas permeable contact lenses that are worn overnight to reshape the cornea (the front of the eye) while the child sleeps. This reshaping can provide clear vision during the day without glasses or contact lenses but because children sleep in the rigid contact lens, there is increased risk of permanent ocular surface changes, corneal infections like ulcers, scarring, and inflammation which can lead to loss of vision. [18-22]

3. **Pharmacologic**

- **Low Dose Atropine Eyedrops**: Atropine is a long-acting dilation drop, like the eyedrops used to dilate children's eyes for their comprehensive eye exams. Mild doses (usually 0.01% to 0.05%) used on a nightly basis have been shown to slow eye growth and myopia progression in children. Low dose atropine eyedrops have been well studied and are typically well tolerated with no long-term side effects or complications.[23-32] Although blurred vision at near, photophobia, pupil dilation and anisocoria are known side effects of atropine, diluting the atropine does mitigate these effects. The FDA has yet to approve a commercially made dilute atropine in the United States so drops have to be compounded by specialty pharmacies in the United States.

Which Strategy is Best?

There is no one treatment that we know reverses or prevents any of the potential long-term risks of high myopia. Many of these treatments above are not covered by insurance so any treatment a family chooses may need to be paid out of pocket and potentially for several years for maximum potential benefit. There are also some serious risks to the treatments such as bacterial keratitis and corneal ulcers from contact lenses (especially ortho-K lenses) and blurring and photophobia from dilute atropine and potential self-limited anisocoria. Behavioral and environmental changes are the only free and no risk option we can recommend at this time. However, with regular monitoring and supervision of these treatments by an ophthalmologist, these treatments can be well tolerated and safe for many children. It is important for any decision regarding myopia control to be made together by the parents, eye care provider and child to determine the best treatment strategy for each child.

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