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SLOWING MYOPIA PROGRESSION IN CHILDREN: EXPLORING INTERVENTIONS AND MANAGEMENT WITH MISIGHT CONTACT LENSES

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ABSTRACT

Due to the rise in myopia prevalence over the past few decades and the sight-threatening conditions linked to severe myopia, including cataracts, glaucoma, and particularly myopic maculopathy, myopia has become a significant global public health concern. The evidence currently available for contact lenses (CLs) intended to treat myopia and halt its progression is reviewed narratively in this article. In order to put the subject in context, we go over the various labels and classifications that have been applied to myopia, the burden that comes with being myopic today, and the available treatments to stop and slow the condition's progression. There is evidence that exposure to sunlight lowers the risk of developing myopia. The best way to control the progression of myopia is through pharmacological treatment with atropine, which is followed by optical interventions like CL fitting (orthokeratology or CLs specific for myopia control) that aim to lessen retinal peripheral hyperopic defocus. We shall pay particular attention to MISight CLs. The US Food and Drug Administration (FDA) has approved MiSight, a daily replacement soft contact lens, based on clinical evidence to slow down the advancement of myopia in children. In order to address this escalating public health concern, health care providers need to stay up to date on developing trends and actively engage in collaborative decision-making with patients and their families.

Keywords: *MiSight contact lens; Myopia control; Soft contact lens for myopia control, Ortho-K lens, Atropine*

INTRODUCTION:

Numerous factors, including the etiology, age of onset, anatomical features of the eyeball, degree of myopia, development pattern, and structural problems, have been used to describe and categories myopia. [1] Aimed to address the following five areas of myopia: progression, etiology, diagnostic thresholds, optics, and structural consequences. Myopia is described as an optical refractive defect whereby light rays entering the eye parallel to the optic axis focus in front of the retina upon relaxation of ocular accommodation. The cause of this is usually an excessively long eyeball, but it can also be due to an excessively curved cornea, an optically powerful lens, or both. Another name for it is nearsightedness. [2] The following definitions classify myopia into three categories: axial myopia, refractive myopia, and secondary myopia. [3]

In the world, myopia accounts for the majority of distance refractive error, affecting 1.45 billion people, or 27% of the total population, in 2010. It is anticipated that the proportion of the population with myopia would increase as well as the number of myopia sufferers in absolute terms. Genetics is thought to have a little role in the onset and progression of myopia; environmental and genetic factors are thought to play a multifaceted role. There is growing evidence that spending more time outside can both lower the chance of developing myopia and slow down the advancement of myopia in individuals who already have it. [4] The prevalence of myopia has grown globally, with epidemiological research indicating a growing rate in European populations, despite the fact that myopia is more common in East Asia. Children who perform more near labor, spend less time outside, and have myopic parents are more likely to develop myopia. Between 80 and 90 percent of young adults have some kind of myopia, with extreme myopia accounting for 10 to 20 percent of cases. In a French group aged 10 to 19, the frequency was observed to be 42.7% in Europe. Nearly half of the world's population is predicted to be myopic by 2050. [5]

At least 30% of people worldwide suffer from myopia, which is the most prevalent refractive error in teenagers and young adults worldwide. Globally, the prevalence of myopia has been rising in recent years. [6] Treatments for myopia have been researched to prevent or delay its start and to reduce its progression, with the goal of minimizing the accompanying ocular diseases. When a child becomes myopic, there are several strategies that can be used to greatly slow down the growth of their myopia, as opposed to using a placebo or single-vision glasses. The best intervention for slowing down myopic development has been low-dose atropine; orthokeratology, peripheral defocus-modifying CLs, and bifocal or progressive addition spectacle lenses have been found to be beneficial as well. [7]

The following are some effective treatments for myopia: high, moderate, and low doses of atropine eye drops; pirenzepine; cyclopentolate; contact lenses that modify peripheral defocus; orthokeratology; progressive addition spectacle lenses; prism bifocal lenses; bifocal lenses; and increased outdoor activities. [8] However, because atropine causes side effects such photophobia, impaired vision, loss of adaptation, and potential sun damage to the lens and retina, compliance has always proven problematic in clinical settings. One drawback of atropine that patients are less aware of is the rebound effect that occurs when they stop taking the drug. During ATOM-1 phase 2, a 1.14D of One year after stopping 1% atropine, myopia progressed. [9] In clinical settings, human eyes react by delaying the expansion of axial length and developing peripheral myopic defocus. Clinical trials on nighttime orthokeratology and devices for peripheral defocus modification used during the day have demonstrated this. [10]

Table 1. Considerations for Management of Myopia Progression

Management Type	Pros	Cons
Atropine (recommended dosage of 0.01%)	• Limited side effects • Can be used with conventional spectacles • Parents can manage • Avoids contact lens wear	• Compounded medication and costs may be a challenge • Mechanism of action unknown
Orthokeratology (Ortho-K)	• Correction-free vision during waking hours • Ideal for activities where water exposure is inevitable or lens dislocation is likely • Parents can assume responsibility for lens application, removal and care • Well-established treatment regimen in some global regions • Minimal reliance on spectacles	• Risk of infectious keratitis • Only corrects low to moderate refractive error • Variable responses • Fluctuating vision possible • Compliance/consistent wear schedule important • More exacting lens parameters
Bifocal/Multifocal Soft Contact Lenses	• Commercially available options • Wide parameters availability for correcting high ametropia	• Risk of infectious keratitis • Increased expense compared with single-vision contact lenses • Back-up spectacles add to the expense of the regimen

Demystifying Myopia:

The most prevalent refractive defect in the globe is myopia. Progressive myopia if untreated can result in issues with vision, ocular alignment, and physiological blindness. The development and incidence of myopia are influenced by both genetic and environmental factors. [11] By releasing chemical mediators that cause cellular and metabolic changes in the retina, signaling alterations to the choroid, and ultimately an increase in scleral and refractive errors, excessive and prolonged accommodation may also act as a catalyst for axial elongation. [12] Children who perform more near labor, spend less time outside, and have myopic parents are more likely to develop myopia. [13]

Concurrently, individuals with extreme myopia frequently experience a wide range of serious consequences. These include posterior sub capsular cataract, myopic macular degeneration, and retinal detachment. When combined with myopia, these conditions impair vision and have a detrimental effect on the quality of life of the affected individuals. Monocular blindness is most commonly caused by myopic macular degeneration. [14]

Myopia is recognized as a complex disorder resulting from a combination of genetic and environmental factors. such include working at close quarters a lot, not getting enough sunlight when young, and having more education. Nonetheless, there is no connection between pathological myopia and this interaction; it might develop during the early years of life or be present from birth. It has been noted that having myopia in one's parents raises the probability of getting myopia yourself. Myopia can also be categorized by age, with late onset primary factors contributing to a faster growth of childhood myopia and childhood or "school" myopia being the two categories. Myopia continues to worsen into the late teens and early adult years after it has begun, though it appears that progression is largest between the ages of 8 and 15 due to the eyeball's continuous development during childhood. [7]

The concept of quality of life is multifaceted and has several domains. Reduced eyesight will result in a major decline in daily living activities, mobility, religious and social participation, and

visually demanding tasks. [15] Myopic macular degeneration-related visual impairment and blindness will rise dramatically, lowering quality of life and having an impact on the economy. [16] Three main variables significantly contributed to the impact of pathologic myopia on a patient's day-to-day life: handicap, disability, and support. Vision-related issues such as reduced visual acuity, loss of contrast sensitivity, issues in glare, and poor color recognition can affect patients with cataracts. [17]

Traditional Approaches and Limitations:

Myopia correction and progression inhibition can be achieved using two optical methods: wearing contact lenses or traditional, bifocal, multi-focal spectacles. It has been proposed that the use of bifocal lenses could slow down the progression of myopia. Numerous studies looked at how bifocal or multifocal glasses affected the advancement of myopia. These glasses provide kids with an excellent vision of distant objects thanks to the top portion of the lens. In contrast to single vision lenses, multifocal or binocular lenses slow the progression of myopia. There was not an additional treatment effect from the base-in prism. [18]

Many therapies can be used to considerably slow the progression of myopia; the most successful ones include atropine, orthokeratology, and peripheral defocus modifying CLs. In spite of treatment, several of the kids exhibit increasing myopia. [19] Rather than utilizing a placebo or single-vision glasses, there are a number of ways that can be employed when a child becomes myopic to significantly slow down the growth of their myopia. The most effective interventions to slow down the progression of myopia have been progressive addition or bifocal spectacle lenses, orthokeratology, low-dose atropine, and peripheral defocus-modifying CLs. [20]

Enter MiSight Contact Lenses:

In contrast to regular spectacles, studies on humans wearing multifocal contact lenses have shown that center distance designs which have more positive power closer to the pupil edge reduce the progression of myopia in myopic children (aged 8 to 12) by -0.73 D in spherical equivalent and 0.32 mm in axial length. Conversely, hyperopic children may experience an increase in axial length from contact lenses with less positive power closer to the pupil edge. [21] The difficulty in interpreting all of this data in a novel way stems from the multitude of potential factors associated with the advancement of myopia. MiSight CL is a concentric-shaped, soft (hydrophilic) CL. Two focal planes are created by the combination of its big center correction zone and a number of alternating distant and near power treatment and correction concentric zones. While the treatment zones create 2.00 diopters (D) of simultaneous myopic retinal defocus during both distance and near vision, retaining acceptable visual acuity, the correction zones' optical power corrects the refractive error. [22]

I won't go into depth here because the epidemiology and complications of myopia have already been thoroughly studied elsewhere. To recapitulate, because to its rising incidence and correlation with conditions including myopic macular degeneration, posterior staphyloma, retinal detachment, cataract, and glaucoma, myopia poses a serious risk to the eye health of the world's population in the years to come. We discuss arguments for and against the hypothesis that effective application of these strategies will lessen myopia-associated disease in later life in section. [23]

One possible treatment option for pediatric myopia is to use multifocal soft contact lenses; however, the safety of contact lens wear for youngsters is a matter of clear concern. Wearing multifocal contact lenses has been shown in several trials to dramatically slow down the progression of myopia compared to single-vision contact lenses or spectacle lenses. In terms of contact lens safety, a review found that the frequency of corneal infiltrative events appears to be lower in younger children and appears to be no greater in adults. [24]

Implementing MiSight: Practical Considerations:

These FDA-approved lenses are an example of a soft, disposable, one-time use lens similar to traditional contact lenses. The contact lenses feature "rings" to defocus in addition to a

periphery portion with full myopic power. Based on this investigation, the MiSight soft contact lens significantly lessens myopic development. [25]

EDOF lenses

Although the Milo lens is not yet available in the USA, a year's supply of the NaturalVue lens can be purchased for roughly $1000. A wider range of sharper vision is possible with both lenses thanks to a special extended depth of focus (EDOF) technology that doesn't compromise accommodative response. [26]

Evidence-based myopia therapy methods include dual focus or multifocal center-distance soft contact lenses, low-dose atropine drops (0.025–0.05 percent), and orthokeratology, which temporarily reshapes the cornea. The only FDA-approved soft contact lens designed to reduce the progression of myopia in children 8 to 12 years old at the start of treatment is the MiSight 1-day soft contact lens from CooperVision. [27] New spectacle lenses that correct peripheral defocus are available in numerous countries and have been demonstrated to inhibit the advancement of axial elongation and spherical equivalent refractive error. [28]

Beyond MiSight: The Future of Myopia Management:

Dual-action zone lenses

MiSight, which was introduced in the USA in March 2020, has been one of the most popular myopia management modalities in Europe. In addition to being a daily lens, which lowers the possibility of infection in kids, it also features an exclusive dual focus design. **Atropine Eye Drops**

A relatively new method for treating myopia control is the use of atropine eye drops. The focusing mechanism of the eye is momentarily relaxed and the pupil is dilated using atropine. It is believed to slow the advancement of myopia by lessening the strain on the focusing mechanism of the eye.

EDOF lenses

Although the Mylo lens is not yet available in the USA, a year's supply of the NaturalVue lens can be purchased for roughly $1000. A wider range of sharper vision is possible with both lenses thanks to a special extended depth of focus (EDOF) technology that doesn't compromise accommodative response.

Orthokeratology

Originally, the goal of orthokeratology was to gently reshape the cornea at night so that daytime correction was not necessary. But later on, researchers discovered that orthokeratology also helps with myopia control! It is among the priciest methods. resulting in peripheral myopic defocus, which instructs the eye to restrict growth while enabling the patient to see clearly during the day. [26]

The Genetic Link

Several studies demonstrate a strong hereditary association with the development of myopia. Offspring of a myopic parent are more susceptible, and this risk increases when both parents have myopia. [29]

The Complications

In addition to requiring glasses, myopia, particularly in situations of high myopia, can result in consequences such glaucoma, myopic macular degeneration, and retinal detachment. [30]

Importance of Annual Exams and Progression Measurements

It is essential to have an annual eye checkup to monitor the development of myopia. Axial length measurements can be made during these examinations to track the elongation of the eyeball, which is a major contributor in the development of myopia. [31] The prevalence of childhood myopia has significantly increased during the last three decades. It is predicted that half of the world's population would suffer from myopia by 2050, a twofold rise from 2000. [32] One of the 21st century's fastest-growing eye health issues is myopia, which disproportionately affects urban areas in Asia. [33] In many nations, myopia is the main factor contributing to vision impairment and blindness. [34] It is crucial to identify the factors that led to the myopia epidemic in East and Southeast Asian urban settings in order to prevent myopia and its consequences.

Conclusion:

MiSight contact lenses are a suitable treatment for young adolescents and children with myopia. MiSight contact lenses are an effective technique for reducing children's myopia progression. It also highlights how crucial early intervention, adherence, and a thorough approach to myopia control are. The trajectory of myopia advancement in young people can be greatly influenced by additional study and the use of these results in clinical practice, which will ultimately enhance visual outcomes and general eye health. Parental myopia can result from an environmental or genetic factor. Offspring of myopic parents typically engage in more indoor activities and spend less time outside. However, spending more time outside can dramatically slow down the progression of myopia in children whose parents are myopic. The short distance for close work and the amount of time spent reading are factors that exacerbate myopia, while longer total hours spent in the sun are preventative measures. Although atropine has demonstrated great efficacy as a therapy for myopia in randomized control studies, its notable side effects especially when taken at high dosages make it poorly tolerated in clinical settings. Its myopia control effect may be lessened or even reversed by the rebound effect. Perhaps more widely accepted and shown to be quite successful in controlling myopia is low-dose atropine. For myopic patients, peripheral refraction changing devices like orthokeratology are good solutions for both myopia retardation and spectacle deletion. Even so, there are still many questions that have been answered about how to slow down children's myopia progression. It is important for parents and kids to always talk to their ophthalmologist about the advantages and disadvantages of the treatment.

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