



THE ROLE OF THE PARENT IN MYOPIA MANAGEMENT

KATHERINE SCHUETZ, OD

This is an exciting era in our profession. We finally have the tools and the abilities, backed by ever-growing research, to slow the pace of myopia. For every adult who dreaded visiting the eye doctor as a kid because there always would be disappointing news that their myopia was worsening, we now have options for their children.

Myopia is becoming a worldwide epidemic, with some Asian countries reporting that more than 80% of adults are myopic. In the United States, the myopia trend has almost doubled in less than 30 years.¹ A 2015 analysis of 15 studies by King's College showed that 47% of Europeans between the ages of 25 and 29 years have some degree of myopia.²

The joy of preventing myopia for the next generation and reducing the risks of complications from high myopia is a privilege I experience when educating parents about myopia control because, let's face it, myopia control is successful only when parents are on board. Parents need a significant amount of time to process the concept of myopia control, so be sure to allow sufficient time in your schedule to educate them. While myopia control can be incredibly exciting for practitioners, parents may be overwhelmed by lack of understanding, worry about the cost, and the hassle of extra appointments that may involve taking their children out of school.

We have several strategies in place to help parents understand myopia control, and we are prepared to pivot our discussion depending on a parent's personality.

MYOPIA CONTROL OPTIONS

We begin with basic myopia control education, because most parents have never heard of this concept. We must know and be able to explain to parents the excellent data that show the preventative power of several different modalities for slowing myopia progression.

Current options for pediatric patients include: single-vision eyeglasses, single-vision or multifocal soft contact lenses, increased time outdoors, limiting near work/

working distance, atropinization, and orthokeratology (ortho-k). We will soon have ophthalmic lenses with optics similar to concentric-ring multifocal lenses for myopia control, but I don't mention them to parents as they're not yet available in the United States.

Prescribing a full noncycloplegic prescription for myopia is the most common treatment in the world, but it doesn't appear to slow the progression of myopia. Therefore, we focus on the alternative options that have well-documented myopia control: increasing outdoor exposure, soft multifocal contact lenses, atropine eye drops, and ortho-k.

Parents need a significant amount of time to process the concept of myopia control, so be sure to allow sufficient time in your schedule to educate them.

We routinely discuss outdoor time and proper near working distance (holding near work at elbow distance and following the 20-20 rule) with every emmetrope and early myope. When parents want a more aggressive method for slowing their child's myopia progression, we move the discussion to the next level in terms of treatments that will need to be monitored more closely in the office.

When first discussing active myopia control, we give parents an overview of the options we offer. Our hand-out reviews what we call the Big Three: compounded atropine eye drops, soft multifocal contact lenses, and ortho-k. We recommend options based on a child's age, maturity, motivation to handle contact lenses, and current prescription.

Before they can make an informed decision, parents need straightforward, easy-to-understand explanations. Some parents want to know the results of every study done, so it's imperative that you have that information readily available.

EXPLAINING THE RESEARCH TO PARENTS

1. *The Great Outdoors*

Sharing data from studies and publications can be incredibly reassuring to parents, so we generally spend time mentioning specific results. Many parents simply want to know why their child is becoming nearsighted (beyond having myopic parents) and what they can do about it in terms of establishing better habits. So, we start with increasing the child's time outdoors.

As time spent using electronic devices has increased during the last 20 years, interest in spending time outdoors has waned for a large segment of the population. Early on, we were seeing adults with computer vision syndrome caused by looking at a computer all day at work, but now even toddlers may spend up to two hours of screen time per day. Increased screen time means less time is being spent outside in natural sunlight. Recognizing this trend, nations such as Singapore created public service posters promoting outdoor time, such as "Keep Myopia Away, Go Outdoors and Play."

Multiple studies show that myopia progression decreases as outdoor time increases.^{3,4} The Sydney Myopia Study of 4,000 children, 6 to 12 years old, found that those who had more reading or screen time and less outdoor time were more myopic than those who spent more time outside.⁵

We simply do not know if a single factor associated with outdoor exposure prevents myopia, but it isn't just that there's less near focus. It may be the increased brightness, which is up to 500 times brighter than indoors, or the fact that when everything is beyond 3 meters, the retina experiences full-field optical infinity. We do know that indoor sports do not have the protective value that being outdoors provides.⁶

The general consensus is that 60 to 90 minutes of outdoor time every day is beneficial for preventing myopia. Case in point: In Australia, where three hours of outdoor time is normal on a daily basis, only 30% of 17-year-olds are myopic.⁷ In areas where that level of outdoor time is impractical, at the very least children can sit by a window in school and at home.

Most parents appreciate having their child hear a doctor recommend spending more time outside.

2. *Atropinization*

For parents who are ready to learn about an approach beyond changing habits, we discuss atropinization. The

use of ophthalmic atropine for myopia control has been studied for years, and recent research with low-dose atropine has shown excellent tolerability with significant decreases in myopia progression.

ATOM1 was a 36-month study that compared an atropine 1% ophthalmic solution daily to placebo.⁸ It showed less than $-0.25D$ change in sphere with the atropine ophthalmic drop compared with more than $1.00D$ additional myopia progression over 36 months with placebo.

ATOM2 monitored patients for 60 months, with dosages of 0.5%, 0.1%, and 0.01% of atropine ophthalmic solution.⁹ A summary of the ATOM1 and ATOM2 studies showed that all dosages of atropine limited myopia progression to less than $-0.50D$ over 24 months, with the most effective dose for prevention being 1.0%.¹⁰

When treatment was stopped, however, the greatest rebound effect was with the higher concentrations of atropine, as the 0.01% group progressed $-0.50D$ further over the next 12 months when treatment ceased as opposed to an increase of $-1.25D$ in the 1.0% atropine group.

Low-dose ophthalmic atropine can be an excellent myopia prevention option if your patient is not a good candidate for the contact lens options. Practitioners must be aware of side effects with atropine, even in low doses. Light sensitivity, reduced accommodation, gastrointestinal issues, hallucinations, and many more are possibilities that we need to be aware of, particularly for young patients. Parents need to know the potential side effects if compounded atropine is a viable option for their child.

3. *Orthokeratology*

The most time-consuming discussion we have with parents is about ortho-k. While ortho-k has been practiced in different forms for decades, the more recent reverse-curve, multi-curve designs allow for greater control in fit and myopia prevention. We tell parents that ortho-k works by creating a different peripheral focus than standard myopia correction, a change that has the advantage of being effective in myopia control when fitted properly. It's not just for correcting the prescription today and allowing for freedom from correction during the day. It's for keeping the prescription from worsening with these special optics.

If a parent asks for more details, we explain that the positive pushing pressure on the central cornea with a negative pulling pressure on the midperipheral cornea makes a "plateau" shape that allows light to be focused onto the macula and midperipheral retina simultaneously. This differs from the typical hyperopia imposed on the midperipheral retina from a myopia correction, which appears to cause axial elongation over time.

MYOPIA CONTROL

What an exciting opportunity to finally have some control into how nearsighted your child will be! Gone are the days where we simply prescribe new glasses and wait to see how much change a child has every year. Now you, and your child, have options. Here are the most effective ones, which we are happy to offer in our office:

- **Soft multifocal contact lenses:** These lenses work by creating a little peripheral blur that slows the stimulus for the retina to grow. Research shows about a 30% decrease in the rate of myopia progression for children using these lenses. It's the least amount of myopia control of all the options; however, using soft daily disposable contact lenses is a relatively easy change to make for many children. Annual cost is typically \$700-\$800 for this type of contact lens.

- **Atropine 0.01%:** This is an eye drop that is used every morning to control myopia, and it slows progression of myopia by about 50%. There are great long-term studies showing the safety and efficacy for over five years with this dosage. Atropine 0.01% must be compounded by a pharmacist and has limited availability, but we have a list of local pharmacies that make this drop. The full-strength atropine 1% has a multitude of unpleasant side effects, so we would never prescribe that dosage for myopia control. Annual cost of the much better atropine 0.01% drop is pharmacy and supply dependent, but the expected amount is around \$1,000. Your child would still wear their normal glasses with this type of treatment.

- **Orthokeratology:** Ortho-k treatment uses retainer lenses, similar in material to gas permeable contacts, that have custom designs that reshape the front surface of the eye. There are two huge advantages to ortho-k. First, the retainer lenses are worn only while sleeping, and typically no glasses or other contacts are used during the day. That's right, no vision correction needed during the day when the retainer lenses are worn at night! Secondly, ortho-k is the most effective treatment for controlling myopia. Studies show a decrease in the progression of nearsightedness by 60% to 100% with this treatment. This treatment involves multiple visits with our doctors and specialty custom-made retainer lenses. The initial cost is around \$2,300, which goes down to just \$400 on an annual basis plus approximately \$400 for the cost of the lenses.

We are so excited to offer these alternatives to our young nearsighted patients. There is absolutely nothing wrong with traditional glasses or contact lenses, but these new options give us the power to control how much prescription your child will ultimately have. Please call to set up your child's myopia control consult with Dr. Schuetz or Dr. Downey.



Dr. Katherine Schuetz • Dr. Hannah Downey
317-420-2020 • www.littleeyes.com

Dozens of studies confirm the efficacy and safety of ortho-k and myopia control, notably the Longitudinal Orthokeratology Research in Children (LORIC) study, the Children's Overnight Orthokeratology Investigation (COOKI) study, the Corneal Reshaping and Yearly Observation of Nearsightedness (CRAYON) study, and the Stabilizing Myopia by Accelerated Reshaping Technique (SMART) study.¹¹⁻¹⁴ All of these studies showed at least one of the following benefits: slowed axial length, less vitreous chamber elongation, and slowed myopia progression.

Ortho-k is a wonderful, challenging addition to a practice and can make a huge impact on the progression of young myopic patients. Ortho-k does not have U.S. Food and Drug Administration (FDA) approval as myopia prevention even if the ortho-k falls within the approved prescription parameters for FDA approved treatment. Practitioners should be sure to review various clinical findings about the use of ortho-k when discussing the benefits and limitations with parents. This is a wonderful opportunity to show the type of passion your practice has for being a trailblazer in the myopia control aspect of our profession.

It's important that you tell parents that outdoor time, atropinization, and ortho-k are off-label uses for myopia prevention and control; even though studies have demonstrated varying amounts of impact on myopia progression. Notably, CooperVision's MiSight contact lenses recently received FDA approval for myopia control.

A final study that we share with parents was published in 2016 and analyzed the efficacy of 16 myopia control options.¹⁵ The investigators analyzed data from 30 randomized controlled trials looking at myopia control for a minimum of one year. Treatment relative to single-vision spectacle lenses or placebo was compared with high-, medium-, and low-dose atropine; multiple designs of contact lenses including GP lenses; undercorrected prescription bifocal spectacles, and more.

The most effective treatment according to this meta-analysis was high-dose atropine of either 1.0% or 0.5%, followed by 0.1%, then 0.01%. The next most effective myopia prevention tool was pirenzepine, then peripheral defocus modifying soft contact lenses, and ortho-k. The study concluded that standard GP contact lenses, standard soft contact lenses, and undercorrected single-vision spectacles were ineffective at slowing myopia progression. Parents need to hear that not treating their child's myopia, or even undercorrecting, does nothing more than keep the child's vision blurry.

4. Peripheral Plus Power Soft Lenses

Another practical option for slowing myopia progression is the use of peripheral defocus modifying contact lenses, i.e., center-distance soft multifocals.

These lenses are an easy transition for current single-vision contact lens wearers, and more options are becoming available.

Parents with presbyopia often think it's odd that their child will be fitted in a lens that gives an older adult better near vision when that is not the child's problem, so it's important to explain how these lenses work. There are multiple manufacturers of soft multifocals, and a common design for myopia control appears to be incorporating center-distance optics, which would include the highest add power the patient can accept without significantly affecting distance vision. Several studies show a moderate slowing of myopia progression, about a 30% to 40% decrease, compared with single-vision contact lenses.¹⁶⁻²¹ It appears that the more peripheral the myopic defocus created from a higher add power, the more effective the lenses are at slowing progression. This is a simple way to decrease myopia progression in young contact lens wearers with minimal disruption to their routine.

The reality in fitting kids in these lenses is that you may not be able to successfully fit them in a center-distance daily disposable lens modality, although good options do exist. If I must fit a center-near design, I tell parents that though it may or may not be effective in myopia control, it is certainly worth a try. We simply monitor to see if there is any progression, just as we would with a center-distance design.

ENSURING PARENT APPROVAL

Our approach to myopia control differs by the personality profiles of the parent and the patient, the family history of myopia, and the degree of myopia the child has. Several myopia assessment tools, such as those available at the websites myopiaprofile.com and mykidsvision.org, can be used to determine a particular patient's expected risk.

For first-time pediatric myopes, we give parents our myopia control brochure as information for the future (see "Myopia Control," page 37). We don't offer much education from the examination chair. We just give Mom or Dad the heads-up that these possibilities exist. This way, parents are familiar with the options when a child's myopia does increase in the future, but we're not asking anything more of the parents initially.

When a child's myopia has been progressing the standard $-0.50D$ or more per year, however, specific recommendations should be given. What a parent may want to do first for myopia control may not necessarily be what you know will be best for the child. Know your data, but also assess the interest of your patients and their parents. You may want 7-year-old Johnny, at $-2.50D$ OU, to start ortho-k immediately, but mom thinks he's too immature, so you start with low-dose atropine for six to

12 months. Or you may have a 9-year-old first-time myope at $-1.00D$, whose emmetropic parents are so astounded that their child needs eyeglasses they can't hear a word you're saying about myopia control. The key is to evaluate the patient's myopia control needs, then adjust your education and the timing of that education to get the parent on board and excited about whatever form of myopia control you recommend.

If you know anything about personality profiles, you'll know that some parents need to feel they're doing something exclusive for their child, something that not everyone can do, which is certainly true of myopia control. Other parents simply need to feel that you, as the child's eye doctor, are emotionally invested in their child's ocular health. That connection alone often will encourage parents to follow your recommendations, even if they aren't certain their child is ready for modalities such as ortho-k or soft multifocals. Parents trust that you know what's best if you show you truly care. Mentioning the association of high myopia with increased risk of complications, such as retinal detachment, glaucoma, and posterior subcapsular cataracts, can be sufficient to motivate some parents to take your advice.

Surprisingly, it can be just as challenging to get a myopic parent excited about myopia control as an emmetropic parent. The emmetrope has no understanding or experience; the myope may be perfectly content wearing $-2.00D$ daily disposable contact lenses and not understand the big deal. Parents who have successfully undergone LASIK may not be motivated, as they assume a similar surgical option will be available for their child. Remind those LASIK parents that if the child has a thin cornea or too high a prescription, surgery may not be a viable option in the future unless they undergo myopia control now.

I always sincerely thank the parents who allow myopia control for their children for giving their time, effort, and finances to that end. Not all families are able or willing to do that, and it's important that we keep the families who choose to support myopia control invested in that goal.

SUMMARY

We can and must do something for our patients to prevent myopia progression. That means parents need to be fully committed to myopia control for their children. The useful tools of increased outdoor time and peripheral defocus contact lenses are an easy discussion for practitioners to have and take very little time in the clinic. Atropinization and ortho-k require slightly more preparation, chair time, and discussion with patients and their parents, but they are incredibly effective at making our young patients less myopic in the future.

With just a little professional expansion, we can pre-

vent high myopia and the problems that come with it for thousands of patients. It starts with being an effective communicator so that parents will follow through with your expert recommendations for myopia control. **CLS**

REFERENCES

- Holden BA, Fricke TR, Wilson DA, et al. Global prevalence of myopia and high myopia and temporal trends from 2000 through 2050. *Ophthalmology*. 2016 May;123:1036-1042.
- Williams KM, Bertelsen G, Cumberland P, et al. Increasing prevalence of myopia in Europe and the impact of education. *Ophthalmology*. 2015 Jul;106:1489-1497.
- Wu PC, Tsai CL, Wu HL, et al. Outdoor activity during class recess reduces myopia onset and progression in school children. *Ophthalmology*. 2013 May;120:1080-1085.
- Xiong S, Sankaridurg P, Naduvilath T, et al. Time spent in outdoor activities in relation to myopia prevention and control: a meta-analysis and systematic review. *Acta Ophthalmol*. 2017 Sep;95:551-566.
- Rose KA, Morgan IG, Ip J, et al. Outdoor activity reduces the prevalence of myopia in children. *Ophthalmology*. 2008 Aug;115:1279-1285.
- Jones LA, Sinnott LT, Mutti DO, et al. Parental history of myopia, sports and outdoor activities, and future myopia. *Invest Ophthalmol Vis Sci*. 2007 Aug;48:3524-3532.
- Dolgin E. The myopia boom. *Nature*. 2015 Mar;519:276-278.
- Chua WH, Balakrishnan V, Chan YH, et al. Atropine for the treatment of childhood myopia. *Ophthalmology*. 2006 Dec;113:2285-2291.
- Chia A, Chua WH, Cheung YB, et al. Atropine for the treatment of childhood myopia: safety and efficacy of 0.5%, 0.1%, and 0.01% doses (Atropine for the Treatment of Myopia 2). *Ophthalmology*. 2012 Feb;119:347-354.
- Chia A, Lu QS, Tan D. Five-year clinical trial on atropine for the treatment of myopia 2: myopia control with atropine 0.01% eyedrops. *Ophthalmology*. 2016 Feb;123:391-399.
- Cho P, Cheung SW, Edwards M. The longitudinal orthokeratology research in children (LORIC) in Hong Kong: a pilot study on refractive changes and myopic control. *Curr Eye Res*. 2005 Jan;30:71-80.
- Walline JJ, Rah MJ, Jones LA. The children's overnight orthokeratology investigation (COOKI) pilot study. *Optom Vis Sci*. 2004 Jun;81:407-413.
- Walline JJ, Jones LA, Sinnott LT. Corneal reshaping and myopia progression. *Br J Ophthalmol*. 2009 Sep;93:1181-1185.
- Davis RL, Eiden SB, Bennett ES, et al. Stabilizing myopia by accelerating reshaping technique (SMART) study three-year outcomes and overview. *Adv Ophthalmol Vis Syst*. 2015 Mar;00046.
- Huang J, Wen D, Wang Q, et al. Efficacy comparison of 16 interventions for myopia control in children: a network meta-analysis. *Ophthalmology*. 2016 Apr;123:697-708.
- Walline JJ, Greiner KL, McVey ME, Jones-Jordan LA. Multifocal contact lens myopia control. *Optom Vis Sci*. 2013 Nov;90:1207-1214.
- Li SM, Kang MT, Wu SS, et al. Studies using concentric ring bifocal and peripheral add multifocal contact lenses to slow myopia progression in school-aged children: a meta-analysis. *Ophthalmic Physiol Opt*. 2017 Jan;37:51-59.
- Cooper J, O'Connor B, Watanabe R, et al. Case series analysis of myopic progression control with a unique extended depth of focus multifocal contact lens. *Eye Contact Lens*. 2018 Sep;44:e16-e24.
- Sankaridurg P, Holden B, Smith E 3rd, et al. Decrease in rate of myopia progression with a contact lens designed to reduce relative peripheral hyperopia: one-year results. *Invest Ophthalmol Vis Sci*. 2011 Dec;52:9362-9367.
- Anstice NS, Phillips JR. Effect of dual-focus soft contact lens wear on axial myopia progression in children. *Ophthalmology*. 2011 Jun;118:1152-1161.
- Lam CS, Tang WC, Tse DY, et al. Defocus incorporated soft contact (DISC) lens slows myopia progression in Hong Kong Chinese schoolchildren: a 2-year randomised clinical trial. *Br J Ophthalmol*. 2014 Jan;98:40-45.

Dr. Schuetz is in private practice as a full-time clinician, splitting time between seeing pediatric patients at a primary care pediatric practice, Little Eyes, and teen through adults at RevolutionEYES. She has no financial disclosures.