Contact Lens Update
CLINICAL INSIGHTS BASED IN CURRENT RESEARCH

Should We Control Myopia Progression or Eye Growth?

September 6, 2021

Jeffrey J. Walline, OD PhD is the Associate Dean for Research at The Ohio State University College of Optometry. He is the Study Chair of the Bifocal Lenses In Nearsighted Kids (BLINK) Study, a National Eye Institute-sponsored randomized clinical trial to investigate the myopia control effects of soft multifocal contact lenses.

The management of myopic refractive error in children has evolved over the past 20 years from simply correcting refractive error to providing treatments that effectively slow progression of the disease. Today, many well designed randomized clinical trials have been reported in the peer reviewed literature to highlight the abilities of a number of treatments to slow the progression of myopia: low concentration atropine,[1-4] multifocal contact lenses,[5-11] orthokeratology contact lenses,[12, 13] and spectacles.[14, 15]

As our knowledge evolved, so did the manner with which we discuss myopia management. For many years, myopia control was discussed only with respect to how much the progression of myopia was slowed. When orthokeratology was first investigated as a myopia control agent, it became apparent that eye growth was the only means by which we could reliably discuss myopia control because orthokeratology temporarily alters refractive error.[16] About that same time, the first optical biometer gained in popularity because of the non-contact measurement and improved precision. Over time, both myopia progression and eye growth became necessary outcome measures in myopia control studies. Consensus from a United States Food and Drug Administration workshop indicated that both myopia progression and eye growth should be used as primary outcomes in myopia control studies, but eye growth may be the preferred metric.

However, there is a difference between clinical care and scientific evidence. Clinical care focuses on the outcomes necessary to treat a patient and monitor progression, whereas scientific evidence includes clinical care outcomes and also explores mechanisms by which they happen. Therefore, monitoring eye grow may be necessary for scientific evidence, it may not be necessary for clinical management of individual patients. This editorial discusses the need to measure eye growth when managing myopia today.

Why Axial Length Should Not Be Measured

The standard of care for measuring eye length has advanced to optical biometers because they do not require corneal contact and they provide approximately 10 times more precise measurement than ultrasound. However, most optometric practices do not have an instrument to measure eye length, so it is rarely performed on young myopic children. Optometrists routinely measure refractive error, so they can easily discuss routine amounts of myopia or progression with parents. Translating average eye length and growth for parents is much more difficult because optometrists don't routinely measure eye length. Myopia progression and eye length are highly correlated,[7] so two measurements of essentially the same thing may not be necessary. Finally, the morbidity associated with myopia, although believed to be due to excessive eye length, is well-described in terms of myopia. For example, for every 1 D less myopia, patients are 40% less likely to experience myopic maculopathy.[17]

Why Axial Length Should Be Measured

On the other hand, experts consider excessive eye length to be the strongest risk factor for sight-threatening complications due to myopia, so measuring eye length may be very beneficial. Furthermore, refractive error is determined by more than simply axial length. Corneal curvature, crystalline lens curvatures, thickness, and refractive index all play a role in determining refractive error. Therefore, treatments may affect the measurement of refractive error without actually altering axial length, so axial length may be a more meaningful measure. For example, orthokeratology contact lenses alleviate nearly all refractive error while making very little change to axial length[18] and low concentration atropine slows myopia progression while having relatively little effect on eye growth.[19, 20] These examples illustrate why including measurements of eye length may provide important clinical as well as research information. Finally, measurement of axial length is more precise than refractive error, so it is easier to differentiate between actual change and measurement error.

Overall, including measures of eye length in clinical care may provide important additional information with few risks to the patient. Although measurement of eye length may be an important addition to myopia management, it is not absolutely necessary for the care of myopia control patients. Optometrists should continue to provide myopia management, even if they don't have an instrument to measure eye length in their practice, but they should investigate ways to monitor eye growth if they desire to know the "full story" related to myopia control.

Interpretation of Axial Length Data

Before purchasing an optical biometer, optometrists should learn how to interpret the findings of the data collected. For example, what does it mean if the eyes of a myopic patient wearing soft multifocal contact lenses grow 0.15 mm over six months? First of all, eye growth should not be considered in six month increments because it varies by season; eyes grow faster during winter months than in the summer.[21, 22] Therefore, at least one year of data should be used to determine whether eye growth is meaningful. Second, it is unlikely that optometrists will know how much the patient's eye grew during the preceding year, so comparison is difficult. Although eye growth may be estimated by the change in myopia experienced by the patient, the estimate varies by age and differs widely among individuals. One rule-of-thumb to keep in mind, though, is that -0.25 D myopia progression is approximately equal to a 0.1 mm increase in axial length. [-0.25 D myopia progression ≈ 0.1 mm axial elongation] Having said that, it is difficult to know if the eyes would have grown 0.15 mm or 0.30 mm with single vision correction because the prediction of future myopia progression is not yet possible. Therefore, the progression may have been cut in half or it may have been unaffected by soft multifocal contact lens wear. It truly is difficult to determine the efficacy of a myopia control treatment for an individual patient.

We also need to understand that as a child grows, so do the eyes. Even emmetropic eyes grow. Therefore, it is difficult to know whether eye growth is physiological (no change in refractive error) or myopic (myopia progresses). A couple of estimates – knowing that they change with age and vary greatly between individuals – to keep in mind are that an emmetropic eye grows approximately 0.1 mm per year[23] and a myopic eye with single vision correction grows about 0.2 mm per year during the ages of myopia progression.[7, 8] [eye growth for emmetrope ≈ 0.1 mm; eye growth for myope ≈ 0.2 mm] Clinically, a parent and optometrist must work together to determine whether or not a child's eye growth warrants changes in myopia management or staying the course. If the decision is made that the myopia management does not seem to be sufficient, the optometrist should remember that it is not yet possible to predict what treatment would provide the most benefit for a specific patient, so switching treatments based on eye growth may not be the best choice. Instead, combination treatments of atropine and orthokeratology have been shown to be more effective than orthokeratology alone, [24-27] although the effect of combining soft multifocal contact lenses and atropine is unknown.[28] The only evidence for potentially providing improved myopia control is with combination therapy, so it is prudent for the optometrist to offer that as a treatment alternative when the parent or the optometrist is not comfortable with the myopia control results experienced to date.

When discussing myopia control with parents, it is necessary to use consistent language that they can understand. We should avoid switching from “myopia progression” to “eye growth” when talking about various treatment modalities. Because orthokeratology studies can only monitor changes in axial length, it may be best to discuss “eye growth” when discussing all modalities of myopia control. The optometrist should also keep in mind that few studies report more than a 0.4 mm difference in eye growth between the experimental and control group. Based on the estimation that 0.1 mm eye growth is approximately equal to -0.25 D myopia progression, that difference equals approximately 1.00 D. Perhaps a better way of explaining myopia control with parents is to tell them, “We hope to reduce the risk of a sight-threatening complication of myopia experienced in adulthood by 40%.”[17]

Summary

The increasing prevalence of myopia, coupled with the dramatic rise in evidence for myopia control, may lead to a new standard of care for the young myopic patient. As our knowledge evolves, so should our lexicon. Perhaps it is time to begin to discuss myopia control in terms of how much we can slow the growth of the eye, which is our ultimate goal. However, optometrists should not let the lack of a biometer keep them from providing their patients with the best evidence-based treatment for myopia. In the short term, provide myopia control to your young myopic patients, and as you gain more experience and provide a more thorough treatment for myopia, begin to consider alternate measures of treatment and better ways to discuss success.

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