



How do we measure myopia progression?

One of the most common questions we get in our myopia clinic is how do we measure progression of myopia over time? It is important to understand that we cannot give any guarantee to patients that their level of myopia will not increase. The myopic progression is related to both genetic factors and environmental factors. The various methods we use to limit progression are proven to significantly slow the progression of myopia compared to more traditional treatments. However even a perfectly fit orthokeratology mold cannot guarantee complete stability of prescription. It is important for parents to understand this. While we cannot promise there will not be an increase in myopia, we do promise to monitor carefully for progression and to make any changes necessary to attempt to limit that progression. Therefore, most patients (and parents) are curious about how we monitor to detect changes.

With patients who are enrolled in myopia control programs involving just atropine treatment or soft myopia control contact lenses, this question is simple: we just measure their vision and prescription at regular intervals to ensure stability. For patients enrolled in our Overnight Sight program (orthokeratology) it is a bit more complicated since we expect them to be seeing well without glasses at most visits. We could simply have a patient take a break from the molds altogether in order to re-measure the true level of myopia, but this is impractical because to get an accurate measurement it could take several days to weeks to completely reverse all treatment and the patient would be blurry during this time. A lot of parents mistakenly look at the patient's visual acuity in the exam room as the only way of monitoring for success, but this is flawed as for most of our patients the myopia control is the primary outcome while the visual clarity is a secondary outcome. They are both important, but clear vision during the day doesn't necessarily mean we're achieving myopia control; likewise, some difficulty with daytime vision doesn't necessarily mean that the myopia is progressing.

Traditionally the primary method has been something called "over-refraction", which is the process of having the patient put on the molds and measuring the residual prescription while the molds are on the eye. When we get an increase in level of myopia while wearing the molds compared to when the patient first started wearing them that is generally an indication that the level of myopia has increased. This method is accepted to be fairly accurate in detecting moderate increases in myopia.

Over the past few years a new method has evolved that involves measuring of the axial length of the eye. The axial length is the length of the eyeball from front to back. When patients get more nearsighted the axial length increases. This length is important because the adverse outcomes related to higher levels of myopia (retinal detachments, cataracts, and a higher risk of macular degeneration and glaucoma) are primarily related to this increase in axial length. There are multiple methods of measuring axial length. One method is called an "A-scan". This method measures axial length but is generally considered to be too inconsistent to measure the very small changes in axial length we are

trying to detect. Therefore, our clinic uses a more sophisticated piece of equipment called “optical biometry”, which is the same method used by cataract surgeons prior to cataract surgery. Optical biometry is very sensitive and can help us detect small increases in axial length. One challenge with monitoring axial length is that young patients have small increases in axial length over time due to the normal growth of the eye even when there is not any myopic progression, but we can use this method to help monitor them and if the amount of axial length growth is greater than expected we can assume some progression of myopia and try to intervene to improve treatment outcomes.

What do we do when there is progression despite appropriate treatment?

As mentioned in the previous section, the methods we use for myopia management are very effective at limiting progression but there is no treatment that is 100% effective for completely stabilizing the level of myopia. What we can do is ensure that the outcome is appropriate and then monitor closely for signs of myopia progression. When there is progression in spite of appropriate treatment, we have some options. If the patient is in our Overnight Sight program (orthokeratology), we can sometimes modify the fit some to make the treatment zone smaller than usual. Some studies have shown that a smaller treatment zone can be more effective for slowing progression. Dr. Dwight is certified in fitting several different designs of Overnight Sight molds and can design molds himself using sophisticated software. If it looks like the treatment zone size can be decreased that may be an option to limit further change to the prescription.

It is also possible to combine methods of myopia management. Atropine can be added to either Overnight Sight or daytime soft myopia control lenses for an additive effect. A recent study showed that combined treatment with atropine and orthokeratology was more effective than just orthokeratology alone. If the patient is in an atropine treatment program the concentration of atropine can be increased. The dose of atropine we generally start with is very low, which allows us to avoid any side effects. However, studies have shown that the effect of atropine on myopia control is dose-dependent, so an increase in concentration can have a better effect to help keep the myopia more stable. If significant increase in myopia levels are detected in your child, depending on the current treatment method and amount of change, we can recommend an appropriate treatment in order to limit further progression as much as possible. Our promise to you is that we will use every method available to us to accurately assess patients for change and will provide options for treatment to limit progression as much as possible. We welcome your questions about your child’s treatment.