

## Myopic Progression Control

One of the most exciting areas of research in Orthokeratology has to do with the control of myopic progression.

At the present time it appears very likely that Ortho-K can practically stop the progression of myopia in the young myope. The story is not complete and the research continues. Each new study is pointing in the same direction: **The use of Ortho-K lens molding on the young myope is the best alternative for preventing the progression of myopia.**

It's better than Rigid Gas Permeable lenses (RGPs), it's better than bifocals, it's better than progressive lenses and it's better than under-correcting the myopia. The only thing proven slightly better so far is daily atropine drops which obviously have a myriad of side effects, including no effect on current myopia. Using this drop would dilate the pupils for over a week causing extreme light sensitivity, and eliminate the lens' ability to change focus. Not a good thing.

It is my belief that nearly every young myope should be given the opportunity to have Ortho-K. It allows you to stabilize them at low levels of myopia where the wearing time of the molds can often be reduced. They don't have to progress over three years from  $-0.75$  to  $-1.75$  before you step in with a better alternative. You don't have to watch the average of  $-0.37D$  per year progression. Keep them at a low level and they will most likely never desire any other type of correction, including Lasik.

**Why does Ortho-K control myopia?** It turns out that myopia development appears to be controlled by the focus of the peripheral retina.

At the recent Orthokeratology Academy of America meeting, there was a fair amount of discussion, continued from last year, about myopia control based on research by Earl Smith, O.D. of the College of Optometry, Houston. His research is with monkeys but the results have been found in many different species.

The eye has an emmetropization process (this means the eye wants to have zero correction) that is mediated primarily by the peripheral retina to a much greater degree than the central retina. The eyeball grows during maturation and stops growing when the peripheral retina comes into focus. During axial length growth the peripheral retina predicts which way the eye is going to change.

Think of peripheral correction as being able to exist separate and distinct from "regular" or central focusing. Or what he calls hyperopic or myopic peripheral defocus. If you have good central acuity, you might have a peripheral defocus in front or behind the retina.

If the peripheral retina is hyperopic, in effect the peripheral image is behind the peripheral retina, then the signal within the retina is to keep growing, and with it the central retina moves further out (grows) from Plano to myopic if measured centrally, like we all do measure it.

If your peripheral retina is myopic, in effect the peripheral image is in front of the retina, the retinal signal is to stop or slow growth.

The key to control the growth is curvature of field - move the peripheral retinal image where it needs to be; for kids who continue to get more nearsighted (progressive myopia), bring it forward so it is closer to the retina in the periphery.

There appears to be an age limit of about 8 years old to actually reverse the process in humans. Older than that is mostly to slow or stop it from getting worse.

Standard spectacle lenses with their "corrected curves" move the peripheral image in the direction that encourages myopic progression.

Ortho-K corneas due to the para-central plus powers induced, move the image closer to the retina which discourages axial growth.

Instruments are being designed to allow peripheral refractions - in effect auto refractors that can measure off-axis rays. Such instruments have the promise of allowing us to accurately predict individual myopic risk.

The whole story won't be in for a long time. If you have distilled what I said above, you might say, "Just under-correct the kids: they'll have relatively less peripheral retinal hyperopia." The problem is that the only two real studies that looked at this were stopped when it became evident that undercorrecting myopes made them worse compared to controls that were fully corrected.

The following studies have been done with humans and Ortho-K.

**LORIC** (Long Term Ortho-K Research In Children) Pauline Cho showed that axial length increase was 50% in Ortho-K patients compared to the control group in glasses. Although Ortho-K slowed myopia, the effect couldn't be predicted for individuals.

*Current Eye Research*, 30:71-80, 2005

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ISSN: 0271-3863 print / 1460-2202 online

[http://www.excelecare.com/pages/5/The%20Longitudinal%20Orthokeratology%20Research%20in%20Children%20\(LORIC\)%20in%20Hong%20Kong.pdf](http://www.excelecare.com/pages/5/The%20Longitudinal%20Orthokeratology%20Research%20in%20Children%20(LORIC)%20in%20Hong%20Kong.pdf)

**CLAMP** (Contact Lens And Myopia Progression) Jeff Walline studied 59 RGP eyes versus 57 soft lens eyes. There was no difference in axial length growth. RGPs flattened the cornea .5D, while soft lenses steepened it .5D. RGPs slowed progression but only a small amount.

Walline JJ, Jones LA, Mutti DO, and Zank K: A Randomized Trial of the Effect of Rigid Contact

Lenses on Myopia Progression. *Arch Ophthalmol* 122: 1760-1766, 2004

<http://www.nei.nih.gov/neitrials/viewStudyWeb.aspx?id=81>

**COMET** (Correction of Myopia Evaluation Trial) Progressive Addition Lenses slowed myopic progression by .13D over five years, an effect considered negligible.

Gwiazda J, Hyman L, Hussein M, Everett D, Norton TT, Kurtz D, Leske MC, Manny R, Marsh-Tootle

W, Scheiman M, and the COMET Group: A randomized clinical trial of progressive addition lenses versus single vision lenses on the progression of myopia in children. *IOVS* 44: 1492-1500, 2003.

<http://www.nei.nih.gov/neitrials/viewStudyWeb.aspx?id=9>

**CRAYON** (Corneal Reshaping and Yearly Observation of Nearsightedness) An update to the LORIC study by Jeff Walline. Ortho-K slows axial growth over the study length of two years. Not yet published. Walline, Jeffrey J., *Slowing Myopia Progression with Lenses*, Contact Lens Spectrum, June 2007

**COOKI** (Children's Overnight Orthokeratology Investigation) essentially proved that Ortho-K works overnight for children in the 8-11 year old group.

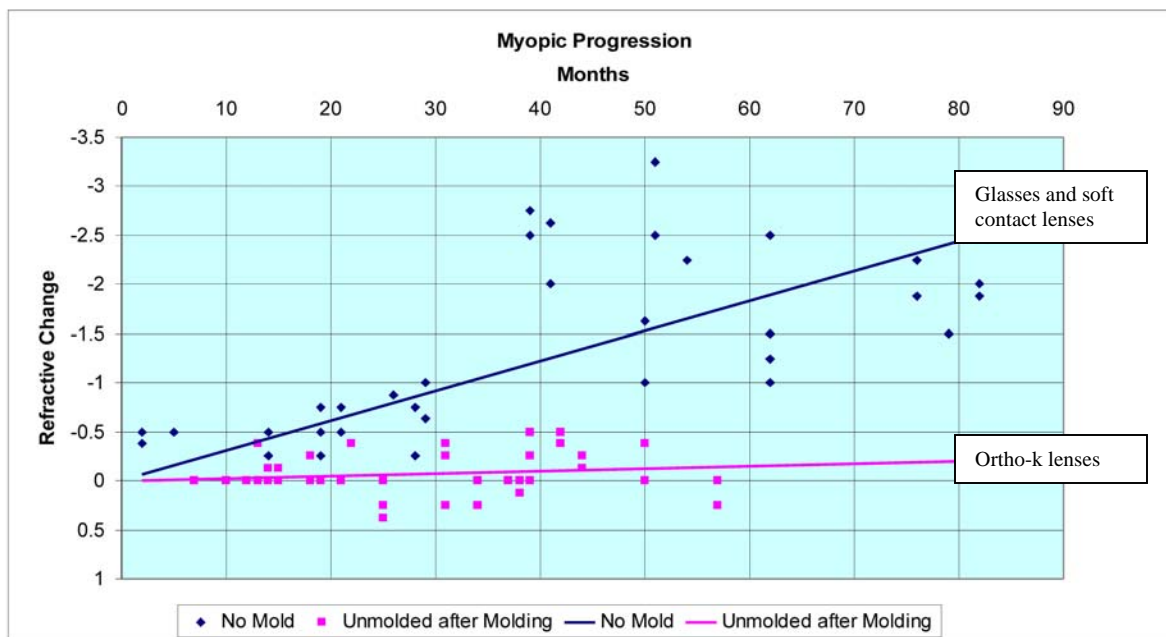
*Invest Ophthalmol Vis Sci* 2003;44: [http://www.dreamlens.at/The\\_Childrens\\_Overnight.pdf](http://www.dreamlens.at/The_Childrens_Overnight.pdf)

**SMART** (Stabilization of Myopia through Accelerated Reshaping Technologies) A five year study where after each year of wear the patient is allowed to normalize without wearing their molding lenses after which they start wearing their lenses again. Preliminary results show stability after one year.

**CANDY** (Controlling Astigmatism and Nearsightedness in Developing Youth) showed myopic progression of  $-0.37D$  per year in normally corrected myopes and  $-0.03D$  per year in Ortho-K patients. Patients were allowed to normalize at various times during their Ortho-K wear. The graph below summarizes the data.

**Over the 3 year period, children who corrected their vision with glasses and soft contact lenses on average had a 1.5 diopter increase of their myopia. The children who wore the Ortho-k correction had a myopic increase of only .37 diopters over the same 3 year period.**

<http://www.wavecontactlenses.com/download/candy.pdf>



The last two studies (SMART and CANDY) are attempting to answer the question of whether the stabilization is just a temporary phenomenon that would disappear on cessation of lens wear. It appears that the Ortho-K effect is such that patients regress back to their starting point of Ortho-K wear, not partially regress or even progress to where they might have been if not wearing Ortho-K lenses.

The studies are not definitive. It will be a long time before such data is recognized as clinical fact. But the overwhelming evidence at this time is that Ortho-K is a very good alternative for young myopes.

### Why haven't I heard about Ortho-k?

The practice of Ortho-k requires a great deal of technical skill, specialized equipment and considerably more office time and is therefore more costly to the patient. Many practitioners don't consider myopia control worth the time and effort. If a doctor is not trained in Ortho-k, it will not be an option or suggestion during an eye exam. It is easier to offer contact lenses, glasses or refractive surgery to correct vision. And Ortho-k doesn't produce a permanent result requiring retainer lenses to maintain improvement. That isn't bad. Because it isn't permanent, it is reversible.

A special Thank you to Dr. Richard Anderson, O.D., F.O.A.A. Camarillo Eyecare, Camarillo, CA and Doctors David Bartels, O.D. and Peter E. Wilcox, O.D.

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