

EYE HEALTHCARE

MYOPIA CONTROL

Myopia (or shortsightedness) is becoming much more common. Although easily corrected with spectacles or contact lenses, most people with myopia would prefer not to become increasingly reliant on glasses or contact lenses for clear vision. It is through this desire that we as optometrists, have sought to understand the causes and key drivers of myopia, and hence position ourselves to seek ways of calming its progression.

As a profession we all know there has been a large exodus towards increased close work and study, namely with desire to 'do better' academically and the almost forceful advent of 2D fixed electronic devices such as laptops, tablets, smart phones etc. – much too quickly for our visual systems to have had the chance to evolve.

The Cause

When we put in the direct muscular effort of focussing (accommodation) the internal muscles of our eyes, in combination with pulling our eyes together (convergence - extraocular muscles) to see a letter or word at the near point, this puts great strain on the eye shape. This strain, from the ciliary muscle, can have the effect of bulging or proptosing the front part of the eye, called the cornea (mainly refractive myopia) and definitely increasing the length of the posterior 25% of the eye (axial myopia). In addition, it raises the intraocular

pressure, due to posterior lens 'bulging' and increased aqueous production, further exasperating the situation. If this near effort is constantly provoked through prolonged study, it is easy to see how this artificial elongation could start to shape the eyeball in an abnormal and irreversible way. The same effect also applies to paretic extraocular muscles and how their anomalous unsynchronised positioning can induce permanent horizontal and oblique astigmatism.

By applying a sequence of multiple tests to each individual, and ascertaining the allowable parameters for correction, i.e. accommodative insufficiency (the higher the accommodative lag, the greater the myopic progression), vergence issues, or quite often a combination of both, then we can tailor a precise result primarily through multifocal contact lenses, or special multifocal spectacles for those with accommodative (and excessive vergence) issues and prism-controlled / decentred bifocals, where there are divergent tendencies. It then is plausible to state, that if we calm this excessive muscular activity each time we engage in prolonged concentration, then we go a long way to making incipient myopia disappear and stabilising pre-existing myopia. This approach is backed by years of fellow professionals' trials in practice and notably by Prof. Bernard Gilmartin / Nicola Logan at Aston University (2004) using MRI studies of the eye.

In addition were the 2 year randomised studies using multifocal with prism (Cheng, Woo, Schmid, Drobe (2011)), multifocal monocular crossover study (Anstice, Phillips (2011)), the

soft multifocal contact lens study (Walline, Greiner, McVey, Jones-Jordan (2013)) and Tom Aller's (2008) study of 12 year old twins using a crossover of multifocal and single vision lenses in California.

There are several other considerations worth noting:

- Diet – Axial length progression is greatest in children where saturated fats and cholesterol were highly prevalent in the diet (Lim et al (2010)). Also, gluten bearing cereals have a softening effect on the growing sclera, leaving elongation more amenable.
- Activity – Myopic risk reduced, the more sport and outdoor activities were engaged in (Jones, Jordan et al (2007), Rose, Morgan et al (2008), and Jacobsen, Jensen, Goldschmidt (2008)).
- Ethnicity – Myopia was found least in white Europeans, 15.6% in 12-13 year olds, Black Afro-Caribbean 27.5% and mostly in the South Asian population 36.8% (Logan, Shah, Rudnicka, Gilmartin, Owen (2011)) – in a study being done with a large group of school children in Birmingham, UK.
- Location – China rural 35% (M), 55% (F) and China Urban 76%
- Family history – Odds ratios:

Father myopic	2.27 X
Mother myopic	2.49 X
Both myopic	5.40 X

(Jones, Jordan et al (2007))

OTHER APPROACHES:

Ortho-K

Light is normally focussed by the cornea and the eyes own natural lens to rest on the posterior central zone (macula), where the image is very sharp. Moving out peripherally, the image gets more and more blurry, as it is imaginarily focussed 'behind' the retina, creating the scenario of 'peripheral hyperopic defocus'. There is a very strong consensus of global optical opinion in developed countries that this peripheral blur is the catalyst for driving progressive myopia in now what is nothing short of an epidemic.

The industry solution for this, is to adopt Ortho-K contact lenses, which bring the peripheral blur from behind the retina to slightly in front, creating a 'myopic defocussed state', and hence apparently stopping the driver of myopic growth.

This whole theory (by Earl Smith), which although was quite brilliant, was based on tests exclusively with animals, with a lot of research (Sankaridurg and separately Gilmartin's MRI studies at Aston) showing little benefit to human subjects. Because the model fails to address where myopia starts from in the first place (an overplay of the emmetropisation process), then it is somewhat difficult to trust the same model to halt its' progression. The use of reverse geometry rigid contact lenses has a decreasing effect on the sagittal depth of the anterior chamber and hence shows a false reduction in the axial length of the eye, which may deem the results questionable during trials.

The LORIC (2005) study in Hong Kong (Cho, Cheung, Edwards) commented

“Ortho-K can have a preventative / controlled effect in childhood myopia – however there are substantial variations in changes in eye length among children and there is no way to predict the effect for individual subjects”.

In this theory it is disputable that the original premise is somewhat forgotten.

The current ‘Cochrane’ review states that Ortho-K “is no better than” the other methods for controlling myopia

Atropine eye drops

Of all the methods to address myopic progression, the use of Atropine has had the most effective short term results (used widely in Taiwan). The drug will dilate the pupil widely and paralyse the eyes accommodative (focussing) system and calm this key driver of axial and radial myopia when excessive close work is being carried out.

Atropine is sometimes used in hospitals for pain associated with uveitis. We don’t use the drug in practice, firstly, because it is not licensed for optometrists to use in the UK, and also due to the unknown effect of long term usage of the drug, discomfort and light sensitivity from prolonged pupil dilation and the need to provide bifocals or multifocals as the near focussing ability is affected.

Research has shown a certain ‘rebound’ effect in trials where the drug was used for 2 years and then stopped – only to show rapid myopic acceleration catching up with the original control group.

Under Correction of Myopia

The intentional under correction of myopia in spectacles and contact lenses follows the rationale that it will reduce accommodative effort at near and hence calm the stimulus for progressive myopia. Unfortunately a lot of studies don’t back up the claim, and in some cases actually show the opposite effect (Dan O’Leary – Hong Kong study) with myogenesis. It also causes under corrected distance blur which could put a child at a disadvantage in the classroom or in sports, and affect their safety.

Conclusion

The benefits of myopia control to the individual are clear in the prevention of significant myopia (as opposed to milder) which can’t be reversed, as this individual would be much more prone to retinal detachment (x8), cataract (x1-5) and glaucoma (x1.3-3.3) later in life. Also, studies show that ‘quality of life’ can be adversely affected in those with high myopia (Rose et al (2000) and Chen et al (2007)). As a profession, we do not guarantee results, as this can depend on many factors, nor do we make promises. The bottom line is that prevention is better than cure, and action is better than inaction.

A full description of the associated principles of Myopia Control can be found on our **Youtube** channel – searching under ‘McCrystal opticians’.

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