New myopia treatment with daily Atropine 0.01% drop

BY SHUAN DAI*

Myopia is a major public health issue and millions of children are impaired due to uncorrected refractive errors. According to the World Health Organisation (WHO) the majority of these are from myopia alone. In the Western world, including New Zealand, 30% of adults have myopia and the number increases to 80% or more in China, Singapore and Hong Kong.

On an individual level, the physical and financial burden of myopia correction, whether being spectacle or contact lens wear is a lifelong cost these myopes must endure. At the community and public health level this has proved to be a costly and significant health issue facing developing and developed nations alike. In the United States alone the estimated cost of refractive correction by glasses for distance visual impairment amounts to US$3.9 to US$7.2 billion dollars annually, without considering the cost of refractive eye examinations.[1] The cost increases considerably if one factors in the cost of managing complications of myopia such as retinal detachment.

Over more than three decades eye care professionals worldwide have been exploring methods to slow down myopia progression. These efforts include eye exercise, Chinese acupuncture, rigid gas permeable contact lens and the more recent introduction of dual focal contact lens and use of progressive glasses, all with very limited success.[2,3]

Atropine is a nonspecific muscarinic antagonist. As we have known for many years, 1% atropine used on a daily basis in childhood can slow the progression of myopia. However, there has been no controlled trial to verify its efficacy and there are many problems associated with this treatment, including intolerability, the cycloplegic effect, and the rebound progression of myopia that occurs after stopping the medication.

It is uncertain how atropine acts to inhibit myopia progression. Initially, inhibition of accommodation was thought to be important, but subsequent studies have shown that atropine also inhibits myopia in animals, such as in chickens, that have no accommodative facility. One theory is that atropine and other muscarinic antagonists may have biochemical effects on the retina or sclera, which in turn affects remodeling of the sclera. Another theory suggests that increased ultraviolet exposure, secondary to pupil dilation, may increase collagen cross-linking within the sclera, thereby limiting scleral growth and axial elongation which are seen in higher myopes.[4]

In the ATOM1 study, published by the Singaporean researchers in 2006, 400 children aged 6-12 years with spherical equivalents of -1.00 and -6.00 D were randomly assigned to atropine 1% and placebo medication in one eye.

At the end of two years, the mean myopia and axial length progression in the ATOM1 study were -0.28+0.92D and -0.02+0.35mm, respectively, in the atropine 1% eyes, compared with -1.20+0.69D and 0.38+0.38mm, respectively, in the placebo eyes. However there were issues with the side effects of the 1% atropine drops such as prolonged pupil dilatation, glare, loss of accommodation and the need for transition progressive spectacles to help with reading.[4,5]

The ATOM2 study, published in *Ophthalmology* 2013 from the same research group in Singapore, aimed to study the efficacy of weaker atropine drops on myopia progression. In this latest study a nightly dose of atropine 0.5% was compared with 0.1% and 0.01% over a two-year period. Like the ATOM1 study, the ATOM2 study involved 400 children aged 6-12 with at least -2D of myopia and with progression of at least -0.5D per year. At the conclusion of the two year trial the rates of myopia progression were -0.30 + 0.63D, -0.38 + 0.60D and -0.49 + 0.60D in the 0.5%, 0.1% and 0.01% groups respectively. There was no significant difference between 0.5%, 0.1% and 0.01% in myopia progression. Progression of less than -0.5D occurred in 63%, 58% and 50% respectively. The myopia progression in all those groups are significantly less than the ATOM control group with a mean rate of progression of -1.20D over the same time. However, contrary to expectations, atropine 0.01% also had significant clinical effects on myopia progression. The myopia progression rate in this group (-0.49+0.63D/2 years) was less than -1 when compared with the 20+0.69D/2 years in the ATOM1 control groups. In addition, the ocular side effect profile was significantly better with accommodation remaining at 11.8D, a mean pupil size of 5mm, and a mean near logMAR vision of 0.01.[5]

The question about what happens with myopia progression after stopping the atropine treatment is of concern to both doctors and patients. This question has been answered in a follow up study; 'Atropine for the treatment of childhood myopia changes after stopping atropine 0.01%, 0.1% and 0.5%', which was published earlier this year. Three years after stopping atropine treatment the overall myopia progression in the 0.5%, 0.1% and 0.01% groups was 1.15+0.81D, -1.04+0.83D and -0.72+0.72D respectively. The rebound is much less in the 0.01% atropine group and this result is very significant when compared to the ATOM control group where -1.2D progression was observed during the two-year period. These findings are very promising for myopia progression control and 0.01% atropine is now considered a routine treatment in many parts of the world for myopia progression.[6]

The findings from these studies are mainly observed in largely Chinese ethnic children and as of today there is no randomised study of the European population, though we expect the results will be similar.

Over the last two years at Eye Doctors we have treated over 20 myopic children with 0.01% atropine. They all have myopia of more than 2D with documented progression of more than -0.50D in the year prior to treatment. To date we have found that none of those on treatment have myopia progression of more than -0.25D on average. There were no significant side effects such as light sensitivity, blurring near vision or allergic reactions. This treatment is currently not funded by the government but for those children with myopia and interested in the treatment the parents can contact Eye Doctors for assessment and treatment monitoring.

In conclusion atropine 0.01% is a safe and the effective treatment for myopia progression with no known significant side effects.

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