Commentary: A drop a day, keeps myopia away?

Myopia is one of the commonest causes of visual impairment worldwide. The global prevalence of myopia is on a rise. A study conducted at our center has shown the prevalence of myopia to be 13.1% in urban school children in Delhi. Not only does it translate to a huge economic and social burden but also predisposes the affected individuals to a host of sight-threatening conditions such as retinal detachment, choroidal neovascularization, myopic maculopathy, and amblyopia. Due to the magnitude of the prevalence of myopia, it has become an important public health issue. A lot of scientific work is being done on myopia to provide more insight into its etiopathogenesis and treatment. A number of environmental as well hereditary factors have been found to be associated with this disease entity. In the Asian populations, this epidemic in a way seems to be a result of rapid education revolution and increased near work like reading.

Most infants are hyperopes. A fast phase of emmetropisation occurs from age 3 to 12 months which is followed by a slow phase which lasts up to the age of 5 years. During this process, the axial length gets adjusted to the optical nature of the cornea and the lens. Myopia can be attributed to the overshooting of this process of emmetropisation. The corrective treatment options for myopia involve use of spectacles, contact lenses, and various refractive procedures. However, in order to target this significant public health problem, various measures are being studied to stop and thwart myopia progression. One of the most important areas under study is the use of atropine eye drops to slow down progression. Till date, atropine and pirenzepine are the only pharmaceutical agents that have shown consistent efficacy in this regard. Other treatments modalities include orthokeratology and soft contact lenses with peripheral defocus modifying designs. However, these are inconvenient to use and have unwanted side effects. The mechanism through which atropine stops myopia progression is not clearly understood. An up and down regulation of retinal and scleral muscarinic receptors has been postulated as possible mechanism. Some studies also contribute the direct influence of atropine on the scleral fibroblast as a possible apparatus to myopia curbing effect. Low-dose atropine (0.01%) has emerged as an effective approach, as proven by Atropine in the Treatment of Myopia studies (ATOM1 and ATOM2). Although ATOM studied Asian patients, involving other populations have been conducted as well and have supported the use of atropine.

Low-dose atropine has very less impact on accommodation, and near vision and pupil size. Most patients receiving low-dose atropine do not require bifocals or sunglasses. Systemic side effects appear to be rare with 0.01% atropine use. Serious anticholinergic side effects such as tachycardia, altered mental status, dry mouth, urinary retention, constipation, and
flushing skin have been seen with higher doses but the same has not been reported with low-dose treatment regimen.

In this issue of IJO Kothari et al. have described a rare side effect of low-dose atropine in the form of convergence excess consecutive esotropia which developed in children operated for intermittent exotropia.[6] Similar phenomenon has been noted with the use of other anticholinergics drugs like oxybutynin and benztropine as well.[7] The paresis of accommodation induced by anticholinergic drugs can lead to a greater than usual accommodative effort. This further is accompanied by an increase in accommodative convergence leading to the development of esotropia. Conversely, in cases of accommodative esotropia, atropine can abolish the esotropia which is attributed to the accommodation apparatus by inducing cycloplegia. However, the effect remains until the duration of action of atropine. In simpler terms, a complete cycloplegia would ward off all the accommodative effort, whereas a mere paresis would lead to a greater accommodative effort.

A similar phenomenon has been reported by Lyu et al. wherein they have reported an increase in esodeviation under cycloplegia with 0.5% tropicamide and 0.5% phenylephrine mixed eye drops in patients with hyperopia and esotropia.[8] They have postulated that a decrease in fusional divergence may contribute to increased esodeviation under cycloplegia. The muzzy vision under cycloplegia can lead to an increased esodeviation depending on the patient’s divergence fusional amplitude. In the cases reported by Kothari et al., the patients had intermittent exotropia as their presentation for which they were operated. In a study conducted at our center involving patients with intermittent exotropia, the mean divergence and convergence values were below normal.[9] Thus, in these cases too, a sub-normal divergence amplitude can be contributory as well.

Atropine appears to be an effective modality for stopping myopia progression. Though off-label, its use has been proven by many clinical studies. However, the prescribing clinician must be fully aware of the side effects and the treatment must be stopped whenever unwanted side effects are observed.

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