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Role of 0.01% atropine in progressive myopia in children.

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ABSTARCT
AIM:- *Role of 0.01% atropine in progressive myopia in children.*
Material and methods : After getting approval from ethical committee of Government medical college kota, we conducted a prospective study of 50 children from march 2021 to march 2022 for progressive myopia (>0.5 D/year) out of which 25 children got treatment in form of topical atropine 0.01%.
The effectiveness of the drug was evaluated by calculating SE (spherical equivalent) at every visit. Mean change in SE was calculated before treatment and after treatment and comparison in both the mean values was done for efficacy of drug.
Results: *Out of 25 treatment group, 14 were males and 11 were females. There was 13 male and 12 female in control group. The mean age was 9.7±2.3 years (range 5- 14 years) and 12.1±2.9 years (6- 16 years) in atropine and control group respectively.*
At baseline mean SE was found to be -2.9±0.149 and -2.63±0.268 whereas BCVA was 0.438±0.067 and 0.65±0.14 in atropine and control group respectively (Table 1). Table 2 shows the rate of myopia progression in study participants. The mean progression rate was found to be lower in atropine group when compared before and after treatment (-0.97±0.055 versus -0.23±0.018). It was found to be 0.23 D/year which is supported by various previous studies like ATOM 2 study (Chia et al. 2012) in which myopic rate progression was 0.42 D after 12 months of atropine use.
Conclusion: *It can be concluded that 0.01% atropine eyedrops used once daily before bed can slow the progression of myopia with very good tolerance and few side effects, making it a recommended treatment to be included in our therapeutic routine.*

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I. Introduction:

When the picture of a distant object is formed anterior to the retinal plane, which most frequently happens as a result of an increased axial length, myopia (near-sightedness) develops.. This results in blurred distant vision and, unlike hyperopia, requires refractive correction at all ages and severity for clear focus[1]. Myopia is the most common ocular disorder, predominantly in East Asia. It is estimated that around 2.5 billion people have developed myopia by 2020, and approximately half of the world population will become myopic ,with 10% of them highly myopic till 2050[2]

In addition to the decreased visual function from optical defocus, myopia is associated with an increased lifelong risk of irreversible blinding conditions such as myopic macular degeneration, retinal detachment, and glaucoma.[3]

The cause and underlying mechanism of myopia progression remain unclear; therefore, its increasing prevalence is not well understood. Several theories have been proposed to explain the recent increase and its earlier onset in children, including a decrease in outdoor activity, an increase in time spent doing near work, and an increase in urbanization. Despite these theories and studies showing that increasing outdoor activity and decreasing near work may help to retard myopic progression[4].Thus, myopia is a major public health concern, posing a heavy health and economic burden to the society. Recently, outdoor activities and decreasing the duration of near work have been reported to be effective in delaying myopia onset. However, among the various interventions evaluated, atropine has been found to be one of the most consistently effective interventions in slowing down myopia progression.

Atropine eye drops were first proposed as a treatment of myopia in the 1920s. Since then, there have been numerous studies on this subject.[5] Atropine eye drops, a nonselective muscarinic antagonist, have been used for myopia control for some years.. Numerous studies13Y22 have demonstrated that atropine is effective in slowing myopia progression in children, although its side effects such as photophobia, blurred near vision, and systematic adverse effects are still sources of concern[6].Initially it was proposed that accommodation was a causative factor in myopia progression therefore cycloplegia following use of atropine may cause retardation of myopia progression. But current theories state that atropine cause pupillary dilation which may result in increased

UA exposure which in turn may limit axial elongation. local retinal effect that may retard myopic progression or a potential biochemical change brought about by binding muscarinic receptors. Higher concentration of atropine (commonly 1%) was initially investigated and found to be substantially effective in slowing axial elongation between 70% and up to 94% in well-conducted trials.[7]

But a higher dose (1%) has a rebound phenomenon with more side effects after cessation the authors suggested that the 0.01% atropine is better in treatment-to-side effect balance.

II. Material And Methods:

After getting approval from ethical committee of Government medical college kota, we conducted a prospective study of 50 children from march 2021 to march 2022 for progressive myopia (>0.5 D/year) out of which 25 children got treatment in form of topical atropine 0.01%.

Inclusion criteria for the study comprises of patients aged between 6 to 15 years with a myopic progression of 0.5 D in past one year (documented) with best corrected visual acuity =>0.2 in each eye , treatment is done with 0.01% atropine eyedrop once at bedtime. Children with history of use of any concominant ocular medication during the treatment period , use of contact lens within 3 days of examination, children with disorder like glaucoma, strabismus, keratopathy, systemic disorders such as respiratory and cardiac illness, cataract, intraocular pressure >21 mm Hg , low birth weight , history of hypersensitivity to atropine , history of ocular surgery were excluded from study.

Control for the study were chosen who were meeting all the inclusion and exclusion criteria except they are not prescribed atropine and with myopic progression > 0.5 D/year. They were also followed for 1 year along with cases.

The effectiveness of the drug was evaluated by calculating SE (spherical equivalent) at every visit. Mean change in SE was calculated before treatment and after treatment and comparison in both the mean values was done for efficacy of drug.

Study design:

Best corrected visual acuity was noted in decimal and complete complete ophthalmic examination of all study participants was done at initial presentation and after 6 and 12 month of starting of treatment.

Under cycloplegic condition refractive error of all patients was evaluated at baseline and after 12 months of treatment in treatment and control groups both using autorefractor. Using refractive power spherical equivalent was determined at baseline, one year before starting the treatment and 12 months after use of drug. Spherical equivalent was calculated as sphere plus half cylinder. Subtracting the SE at baseline from SE at 1 year before treatment (rate of progression before treatment) and SE after 12 months of treatment from SE at baseline (rate of progression after treatment). Similarly the rate of progression was calculated in control group.

Treatment patients were considered as responders or non responders on the basis of SE progression (responders if SE progression was ,0.5 D and non responders if progression was found to be > 0.5 D)

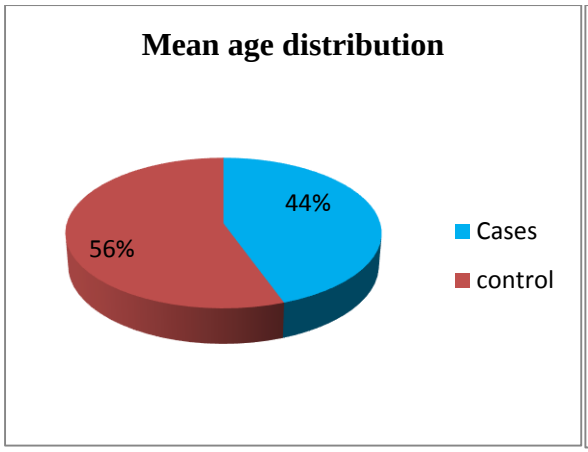
Safety:

We as ophthalmologists may also concerned about side effects of atropine. So all participants were informed about side effects and were asked about them at every visit. Among all treatment group most common side effect found to be photophobia (10%). Rest were having no major side effect that forced them to discontinue the treatment and overall the whole study was uneventful in terms of systemic side effects and atropine 0.01% was well tolerated.

III. Results:-

Table 1:- Demographic and baseline characteristic of subjects.

SN.			Atropine 0.01 group	Control group	P value
1	Patients (n)		25	25	
2	Gender	Male	14	13	
		female	11	12	
3	Mean Age (Mean±2SD)		9.7±2.3 (5-14 years)	12.1±2.9 (6-16)	0.0022
4	Visit 1	Spherical equivqlence (SE) (Mean±2SD)	-2.91±0.149	-2.63±0.268	<0.0001
		BCVA (Mean±2SD)	0.438±0.067	0.65±0.14	<0.0001



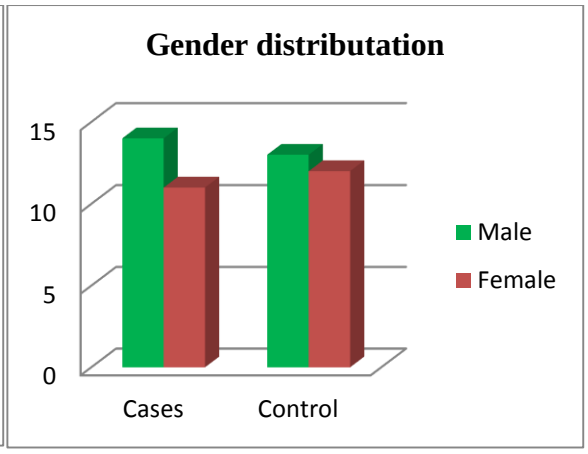
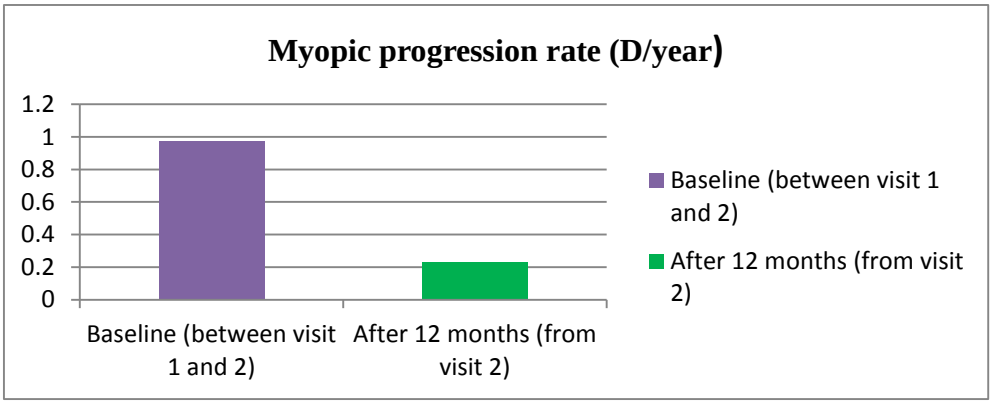


Table 2:- Myopic progression rate.

SN	Myopic progression rate (D/year)	Atropine 0.01 group	Control group	P value
1	Baseline between visit 1 and visit 2 (Mean±2SD)	-0.97±0.055	-0.63±0.14	<0.0001
2	After 12 months (Mean±2SD)	-0.23±0.018	-0.80±0.36	<0.0001



IV. Discussion:

We conducted a prospective study after getting clearance from ethical committee of our institution. Our study enrolled total 50 participants whom myopic progression was >0.5 D /year and best corrected visual acuity was > 0.2 decibel. 0ut of 50, 25 participants were prescribed topical atropine 0.01 % in both eyes to be instilled at bedtime after complete ophthalmic examination. Rest 25 controls were same in all aspects to treatment group expect they were not prescribed atropine. Out of 25 treatment group, 14 were males and 11 were females. There was 13 male and 12 female in control group. The mean age was 9.7±2.3 years (range 5- 14 years) and 12.1±2.9 years (6- 16 years) in atropine and control group respectively.

At baseline mean SE was found to be -2.9±0.149 and -2.63±0.268 whereas BCVA was 0.438±0.067 and 0.65±0.14 in atropine and control group respectively (Table 1). Table 2 shows the rate of myopia progression in study participants. The mean progression rate was found to be lower in atropine group when compared before and after treatment (-0.97±0.055 versus -0.23±0.018). It was found to be 0.23 D/year which is supported by various previous studies like ATOM 2 study (Chia et al. 2012) in which myopic rate progression was 0.42 D after 12 months of atropine use.

V. Conclusion

It can be concluded that 0.01% atropine eyedrops used once daily before bed can slow the progression of myopia with very good tolerance and few side effects, making it a recommended treatment to be included in our therapeutic routine. However, it is essential to get the parents on board with using the treatment and to change habits in order to increase outdoor activities exposed to sunlight.

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