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# TO STUDY THE EFFECT OF LOW DOSE ATROPINE ON MYOPIA PROGRESSION

Ophthalomology

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## ABSTRACT

**Purpose:** To study the effect of low dose atropine on myopia progression **METHODS:** A total of 100 children were included in the study. All the children with a history of myopic progression of atleast -0.75 per year. All the children between 5-13 years were included in the study. 50 children were given atropine (0.01%)eye drops and 50 children were given placebo lubricant eye drop. **RESULTS:** After 12 months , mean and standard deviation of SPHERICAL EQUIVALENT in patients on ATROPINE IS 0.50 AND 0.43 and patients on PLACEBO is 0.77 and 0.51 and MEAN **AND STANDARD** DEVIATION of AXIAL LENGTH in patients on ATROPINE is 0.33 and 0.20 and patients on PLACEBO is 0.42 and 0.20. P value of spherical equivalent after 12 months is 0.0005 P value of axial length after 12 months is 0.026 P value is SIGNIFICANT **CONCLUSION:** OUR STUDY CONCLUDED THAT LOW DOSE OF ATROPINE (0.01%) SLOWS DOWN THE PROGRESSION OF MYOPIA AND AXIAL LENGTH IN CHILDREN WITH LOW AND MODERATE MYOPIA, AS COMPARED WITH PLACEBO TREATMENT.

## KEYWORDS

## INTRODUCTION

Nowadays , a major international public health concern is Pediatric Myopia. It's prevalence has increased worldwide significantly(1,2).
Age: Onset of Myopia is usually predicted between the age of 8 and 9 years (3,4)

It has been seen that there has been decrease in outdoor activity, time spent for doing near work is increased in children .These all factors leads to increase in Myopia progression. Whereas, increasing in outdoor activity and decreasing in near work helps in decreasing Myopia progression.(5,6)Myopia is the most common cause of Avoidable visual outcome . Pathological Myopia is associated with increase risk of Myopic Retinopathy, Retinal Detachment, Choroidal Neovascularisation , Glaucoma, Cataract , Macular Degeneration.(7-10)

In Myopia there occurs increase elongation of the eyes that stretches the Retina and choroid and also increases the risk of ocular pathologies including Retinal detachment and Myopic Maculopathy.(11,12)

Topical atropine has the strongest clinical effect on slowing the progression of Myopia.(13-15)

Atropine primarily have a local effect on retina which helps in retarding the Myopia progression or Atropine binds to Muscrinic receptors which are present on sclera that causes biochemical changes and helps in decreasing the progression of Myopia. Two newer theories suggest that on dilating pupil there occurs increase in ultraviolet A exposure which leads to decrease in Axial elongation or Myopia. Secondly, Myopia is associated with increase in chronic inflammation in the eye which is decreased by Atropine instillation.(16-19)

0.01 % Atropine is the most common strategy for decreasing the progression of Childhood Myopia in Asian countries.(20)

Using 0.01% Atropine helps in controlling Myopia and its progression was based on findings from Atropine for treatment of Childhood myopia {ATOM } studies.(21)

Two clinical trials that are ATOM2 study and low concentration Atropine for Myopia progression {LAMP} study, these two trials have shown that 0.01% Atropine helps in slowing eye growth.(22)

In INDIA, the MUMBAI GROUP OF PEDIATRIC OPHTHALMOLOGISTS recommended use of 0.01% Atropine helps in treatment of childhood myopia. About two-third if pediatric ophthalmologist are using 0.01% ATROPINE routinely.(23)

**REBOUND MYOPIA:** Treatment of Myopia done by instilling 0.5% and 0.1% drops of ATROPINE, it has been seen that there was rebound myopia In eyes after discontinuing the ATROPINE of dose 0.5% and 0.1% whereas patients receiving low dose 0.01% concentration of Atropine causes sustained and minimal change after treatment cessation.(24)

## MATERIALS AND METHODS

- A total of 100 children were included in the study.
- All the children with a history of myopic progression of atleast -0.75 per year. All the children between 5-13 years were included in the study.
- 50 children were given atropine (0.01%)eye drops and 50 children were given placebo lubricant eye drop.

## INCLUSION CRITERIA

- AGE-5 TO 13 YEARS
- MYOPIA ≥ 2.00 D(CYCLOPLEGIC REFRACTION; SPHERICAL

## EQUIVALENT

- NO PRIOR OR CURRENT TREATMENTFOR MYOPIA PROGRESSION

## EXCLUSION CRITERIA

BEST CORRECTED VISUAL ACUITY<6/12
AMBLYOPIA
ASTIGMATISM≥1.5 D
OCULAR HYPERTENSION/GLAUCOMA PRIOR INTRAOCULAR SURGERY ALLERGY TO ATROPINE EYE DROPS

## RESULTS

**TABLE 1**

| AGE 5-6 | ATROPINE 505 | PLACEBO 506 |
|---|---|---|
| 6-7 | 10 | 3 |
| 7-8 | 3 | 9 |
| 8-9 | 3 | 3 |
| 9-10 | 4 | 10 |
| 10-11 | 6 | 5 |
| 11-12 | 10 | 10 |
| 12-13 | 9 | 4 |

**TABLE 2**

| Gender | ATROPINE 50 | PLACEBO 50 |
|---|---|---|
| MALE | 23 | 18 |
| FEMALE | 27 | 32 |

| Mean (Standard Deviation) | Mean | Std Deviation | Mean | Std Deviation | |
|---|---|---|---|---|---|

## DISCUSSION

Atropine is known as non-selective antagonist of muscarinic acetylcholine receptors and high concentrations of atropine block all receptor subtypes (M1, M2, M3, M4 and M5).(25,26)

On myopia progression Atropine has a dose related response and side effects have been c reported at high doses (0.5% to 1.0%), but less reported in moderate (0.01% to 0.5%) and low concentrations (0.01%). Whether there is any difference in the efficacy and side effects of different concentrations of low-dose atropine there are very less consensus.(27- 29)

Chia et al compared the safety and efficiency of 0.5%, 0.1% and 0.01% dose atropine in myopic children and found that there was a significant difference in myopia progression between the 0.5% atropine and 0.01% and 0.1% atropine, but there was no significant difference between the 0.01% and 0.1% groups after 1 and 2 years of follow-up.(30,31)

Pupil diameter increase and accommodative amplitude reduction count among the most important side effects when using muscarinic antagonists as an option for myopia progression.(32-35)

Cooper et al compared the pupil diameter increase and accommodative amplitude reduction after using 0.01%, 0.02% or 0.05% atropine for 1 week. They reported a similar conclusion that 0.01% and 0.02% atropine had the same clinical effects on accommodative amplitude reduction and pupil diameter dilation. (36)

Kaymak et al observed the 1 day's effects of very low-dose atropine (0.01%, 0.005% and 0.001%) on pupil diameter and accommodative amplitude in young adult. Clinically significant effects, on pupil diameter increase and accommodative amplitude reduction, were found for the 0.01% and 0.005% group. (37)

- In 1989, Yen et al19 reported a randomized controlled trial of atropine for the treatment of myopia progression. This study compared atropine 1% dosed every other day in both eyes with 2 control groups (cyclopentolate 1% dosed nightly and a placebo drop dosed nightly). In the 247 Taiwanese children included in the study, the mean myopic progression over 12 months was 0.220.54 diopter (D),

- 0.580.49 D, and 0.910.58 D per year in the atropine 1%, cyclopentolate 1%, and placebo groups, respectively (P < 0.01 for all comparisons). Although atropine 1% was found to reduce myopic progression, there were several intolerable side effects and dropouts, and only 96 of the 247 enrolled participants completed the 1-year study(38)

- Shih et al21 evaluated 227 Taiwanese children, comparing the atropine 0.5% group plus multifocal (progressive) lenses with 2 control groups (multifocal progressive lenses and single-vision lenses). At 18 months, 188 participants were available for follow-up and had a mean myopic progression of 0.420.07 D, 1.190.07 D, and 1.40.09 D for the atropine 0.5% plus multifocal progressive lenses, multifocal progressive lenses only, and single-vision lenses only groups, respectively (P < 0.0001 for the atropine group compared with both control groups)(39)

In 2006, the Atropine for the Treatment of Myopia (ATOM) 1 study23 was reported in Singapore. This study enrolled 400 Asian children and randomized them to either atropine 1% or a placebo eyedrop in 1 eye. Three hundred forty-six children completed the 2-year follow-up, resulting in a reported myopic progression of 0.280.92 D in the atropine 1% group compared with 1.20.69 D in the placebo group over 2 years. The difference in myopia progression between the 2 groups at 2 years was 0.92 D (95% confidence interval, 1.10 to 0.77 D; P < 0.001). (40) 2012 (ATOM 2),26 which compared lower doses of atropine with historical controls. In this study, 400 children were assigned randomly in a 2:2:1 ratio to atropine 0.5%, 0.1%, or 0.01% nightly for 2 years. The mean myopic progression at 2 years in the 355 participants who completed the entire follow-up was 0.300.60 D, 0.380.60 D, and 0.490.63 D in the atropine 0.5%, 0.1%, and 0.01% groups, respectively (P ¼ 0.02, atropine 0.01% vs. atropine 0.5% groups; P ¼ 0.05, between other concentrations).(41)

In 2009, Tong et al24 reported the long-term results of the children initially enrolled in ATOM after a 1-year washout period. Of the 400 children initially enrolled, 333 children completed the 3-year follow-up (2 years on treatment and followed by a 1-year washout period). During the Pineles et al Ophthalmic Technology Assessment 1859 1-year washout, myopic progression was 1.140.8 D/year for the atropine 1% group and 0.380.39 D/year for the control group (P < 0.0001). Conversely, over the entire 3-year study, the myopic progression was 0.460.26 D/year and 0.520.30 D/year for the atropine 1% and control groups, respectively (P ¼ 0.043). This is statistically significant, but is unlikely to be of clinical relevance for most physicians and patients.(42) It should be noted that myopia progression is smaller in eastern children than in European children.(43)

Progressive myopia risk was associated with younger age at baseline in the unadjusted regression analysis which may be predominantly explained by the fact that younger children experience more myopia progression in younger age.(44)

Overall, atropine, 0.01%, has no serious adverse effects and generally well tolerated.(45-47)

## CONCLUSION

OUR STUDY CONCLUDED THAT LOW DOSE OF ATROPINE (0.01%) SLOWS DOWN THE PROGRESSION OF MYOPIA AND AXIAL LENGTH IN CHILDREN WITH LOW AND MODERATE MYOPIA, AS COMPARED WITH PLACEBO TREATMENT.

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