ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 01 | January - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARATIVE EFFECTIVENESS OF MYOCARE LENSES AND LOW-DOSE ATROPINE (0.01%) IN SLOWING MYOPIA PROGRESSION: A RETROSPECTIVE OBSERVATIONAL STUDY

Ophthalmology

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ABSTRACT

Background: Myopia is the most common eye problem and is estimated to affect 1.5 billion or 23 % wide. The most common treatment for myopia is single vision glasses without any control over progression. Atropine 0.01% has been widely used for myopia control in the population with supporting evidence. This study compares the effectiveness of these two treatment modalities with comparison to single vision lenses to provide further insights into their role in myopia control. **Methods:** This retrospective observational study was conducted at a hospital-based ophthalmology department. Medical records of children aged 5–16 years with myopia between –0.50 D and –10.00 D, and at least one year of follow-up, were reviewed from January to December 2024. Patients were assigned to one of three groups: MyoCare lenses, atropine 0.01% drops, or single-vision (SV) spectacles. Cycloplegic autorefraction and axial length (Oculus Pentacam) were recorded at baseline, 6 months, and 12 months. The primary outcomes were changes in SER and axial length. **Results:** Both the MyoCare and atropine groups demonstrated significantly less myopic progression compared with the SV group after 12 months. MyoCare lenses reduced SER progression by 65.45% and axial elongation by 69.00%, while atropine 0.01% achieved reductions of 71% and 75%, respectively. No significant differences were observed between MyoCare and atropine in either SER change or axial growth. **Conclusions:** MyoCare lenses and atropine 0.01% were similarly effective in slowing myopia progression over 12 months and significantly outperformed single-vision lenses. Both interventions represent safe and practical options for managing childhood myopia, although longer-term, larger-scale studies are needed to validate these findings.

KEYWORDS

INTRODUCTION

Myopia, or near-sightedness, is a refractive error in which distant objects appear blurred due to the eye's axial length becoming too long or, less commonly, excessive refractive power of the lens[1]. This results in light from distant objects focusing in front of the retina rather than directly on it. Beyond causing visual impairment, moderate-to-severe myopia significantly increases the risk of sight-threatening complications, including myopic macular degeneration, retinal detachment, early-onset cataract, and glaucoma. Globally, the prevalence of myopia has risen sharply in recent decades; projections suggest that by 2050, nearly half of the world's population will be affected, making it a major public health concern[2].

Myopia typically has its onset between 8 and 15 years of age, a period during which rapid ocular growth makes children particularly susceptible to progression[3]. Management strategies for controlling myopia progression have evolved substantially and include optical interventions (such as multifocal spectacles, orthokeratology, and defocus-incorporated spectacle lenses), pharmacological therapies (notably low-dose atropine), and lifestyle measures promoting healthy visual habits[4]. While earlier generations of myopia-control spectacle lenses, such as executive bifocals and progressive addition lenses, showed limited efficacy, they provided the foundation for more advanced lens technologies.

MyoCare® lenses represent a recent advancement in optical myopia control[5]. These lenses incorporate Cylindrical Annular Refractive Elements (C.A.R.E.®) that generate alternating zones of retinal correction and myopic defocus, thereby reducing hyperopic peripheral defocus and slowing axial elongation. The design is age-tailored: MyoCare® lenses are intended for younger children, while MyoCare® S lenses are optimized for older children and adolescents, differing in the central clear zone and mean addition power to accommodate adaptation and visual needs. Low-dose atropine (0.01%) is another widely adopted and evidence-based option for myopia control[6]. Although its mechanism is not fully understood, it is believed to reduce axial elongation through non-accommodative pathways and has been shown to offer a favorable safety profile in long-term use.

Given the increasing range of available myopia-control strategies, comparative real-world evidence is essential to guide clinical decision-making. This study aims to compare the effectiveness of MyoCare® spectacle lenses and low-dose atropine (0.01%) in slowing myopia progression in children using retrospective observational data.

MATERIAL AND METHODS

Study Design

This study was conducted at a hospital-based ophthalmology department. Ethical approval was obtained from the institutional ethics committee, and written informed consent was secured from the parents of all participating children. Medical records from 1 January 2024 to 31 December 2024 were reviewed. Clinical data from patients using MyoCare lenses, low-dose atropine 0.01% eye drops, and single-vision (SV) spectacle lenses were included.

Inclusion And Exclusion Criteria

Children aged 5–16 years with myopia ranging from –0.50 D to –10.00 D, astigmatism ≤2.25 D, anisometropia ≤2.00 D, and at least 12 months of follow-up were eligible for inclusion. Exclusion criteria included diabetes, keratoconus, strabismus, amblyopia, ocular disease, use of medications affecting refraction, and any known genetic syndrome.

Study Sample

A total of 110 patients met the eligibility criteria. Of these, 38 patients were prescribed MyoCare lenses, 36 received atropine 0.01% eye drops, and 36 used single-vision spectacles. Patients in the MyoCare group were instructed to wear their lenses full-time, except during sleep and bathing. Atropine 0.01% eye drops were compounded in the hospital pharmacy and dispensed to patients, as commercial formulations were unavailable locally.

Data Collection

Extracted data included age, sex, date of each visit, cycloplegic refraction (used to calculate spherical equivalent refraction), and baseline axial length. Patients were categorized into two age groups: 5–10 years and >10 years. Cycloplegia was induced using cyclopentolate 2.5%, instilled every 10 minutes for 30 minutes. At 45 minutes post-instillation, cycloplegic autorefraction was performed to obtain spherical equivalent measurements. Axial length was measured using the Oculus Pentacam.

Follow-up And Outcome Measures

Patients were evaluated at 6 months and again at 12 months. The primary outcome measures were changes in spherical equivalent refraction (SER) and axial length over the 12 months.

RESULTS

A total of 110 patients were included in the study: 38 in the MyoCare group, 36 in SV spectacle group, and 36 in the low-dose atropine (0.01%) group. Of these, 65 were male, and 45 were female. The mean baseline age was 9.86 ± 2.50 years (range: 5–16 years). Baseline SER ranged from –0.50 D to –10.00 D, and the mean axial length was 24.45 ± 8.50 mm (range: 22.00–26.80 mm; Tables 1, 2, and 3).

Table 1. Myopic Progression In The Myocare Group

NO.PATIENTS	AGE	S.E	AXL	AFTER 1 YEAR S.E	AXL
7	2-4 years	-1.5 TO -3	23 mm	-1.5 TO -3.5	23 mm
9	4-6 years	-1.5 TO 4.5	23-24 mm	-2.00 TO -3.5	23-24 mm
9	6-8 years	-2.00 TO 6	23-25 mm	-2.5 TO -6.50	23-25 mm
7	8-10 years	-2.OO TO -8	23-26 mm	-2.5 TO -8.50	23-26 mm
5	Above 10 years	3.50 TO -9.0	24-27 mm	-4.0 TO≤-9.5	24-27 mm

Table 2. Myopic Progression In The Atropine Group

NO. PATIENTS	AGE	S.E	AXL	AFTER 1 YEAR S.E	AXL
7	2-4 years	-1.5 TO -3	23 mm	-1.5 TO -3.5	23 mm
9	4-6 years	-1.5 TO 4.5	23-24 mm	-2.00 TO -3.5	23-24 mm
9	6-8 years	-2.00 TO 6	23-25 mm	-2.5 TO -6.50	23-25 mm
7	8-10 years	-2.OO TO -8	23-26 mm	-2.5 TO ≈-8.50	23-26 mm
5	Above 10 years	3.50 TO -9.0	24-27 mm	-4.0 TO ≤ 9.50	24-27 mm

Table 3. Myopic Progression In The Single-vision Group

NO.PATIENTS	AGE	S.E	AXL	AFTER 1 YEAR S.E	AXL
7	2-4 years	-1.5 TO -3	23 mm	-3.00 to -4.00	23-24mm
9	4-6 years	-1.5 TO -4.5	23-24 mm	-3.00 to- 5.5	23-25mm
9	6-8 years	-2.00 TO -6	23-25 mm	-3.50 to -7.50	24-26mm
7	8-10 years	-2.OO TO -8	23-26 mm	-3.50 to> -9.50	24-28mm
5	Above 10 years	3.50 TO -9.0	24-27 mm	-4.50 to -10.50	24-28mm

After 12 months, both the MyoCare and atropine groups demonstrated significantly less myopic progression compared with the single-vision group. No significant difference in SER change was observed between the MyoCare and atropine groups. Similarly, axial length elongation was significantly lower in the MyoCare and atropine groups compared with the single-vision group, with no significant difference in axial length change between MyoCare and atropine (Figures 1 and 2).

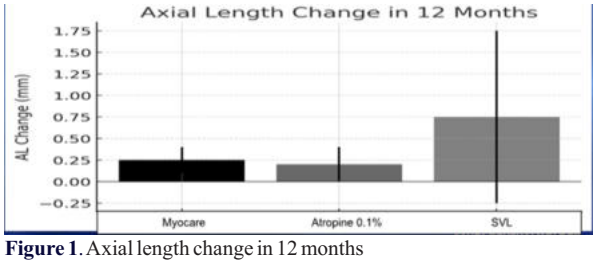

Figure 1. Axial length change in 12 months

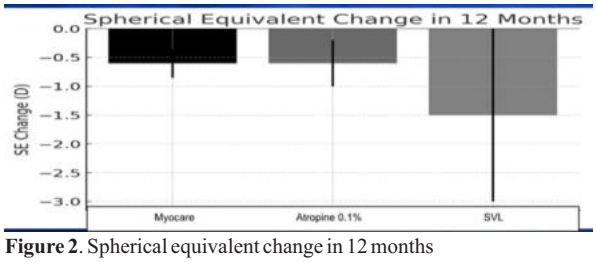

Figure 2. Spherical equivalent change in 12 months

DISCUSSION

The findings of this study demonstrate that both MyoCare lenses and low-dose atropine 0.01% are effective in slowing myopia progression over 12 months. Both treatment groups showed comparable efficacy in controlling changes in SER and axial length, with significantly better outcomes than the single-vision lens group. MyoCare lenses resulted in 65.45% reductions in SER progression and 69.00% reductions in axial elongation, while atropine 0.01% achieved reductions of 71% and 75%, respectively. Although percentage-based reporting is commonly used, it may be misleading due to variability in long-term progression rates and the diminishing effect of interventions over time. Therefore, absolute changes in axial length are recommended for more accurate comparisons of myopia-control efficacy.

Our findings align with existing evidence supporting the efficacy of low-dose atropine and advanced myopia-control spectacle lenses. The ATOM2 study from Singapore reported that atropine 0.01% slowed myopia progression by approximately 50% over two years with minimal side effects[7]. Similarly, the LAMP study demonstrated that while higher concentrations (0.05% and 0.025%) provided greater efficacy, atropine 0.01% still offered moderate control with an excellent safety profile[8]. Evidence supporting MyoCare lenses has been strengthened by multiple international studies. A two-year randomized, double-masked European trial involving 234 children aged 6–13 years showed that MyoCare lenses significantly slowed myopia progression relative to single-vision lenses[9]. A Spanish multicentre study reported a reduction in SER progression from –1.01 D to –0.44 ± 0.41 D ($p < 0.0001$) and axial elongation of 0.27 ± 0.20 mm over 12 months[10]. Additionally, data presented at the 2024 ARVO Annual Meeting by Zeiss Vision Care further established the effectiveness of MyoCare lenses in both Asian and Caucasian children[11].

Several studies also support the use of atropine 0.01% as a first-line pharmacological intervention. Myles et al. reported a 75% reduction in SER progression with low-dose atropine[12], while Clark et al. showed similar outcomes among high myopes[13]. Sacchi et al.[14], Joachimsen et al.[15], and Moriche-Carretero et al.[16] likewise, reported substantial reductions in myopia progression across diverse populations, reinforcing the global applicability of low-dose atropine therapy.

However, this study has several limitations. The relatively small sample size and the 12-month follow-up period limit the generalizability of our findings. Larger studies with longer follow-up are needed to validate these results and evaluate the long-term effectiveness and stability of both MyoCare lenses and low-dose atropine. Moreover, future research should explore combination therapy, such as the concurrent use of atropine and MyoCare lenses, which may offer additive benefits.

CONCLUSION

Both Myocare lenses and atropine 0.01% are effective in slowing the progression of myopia over 12 12-month period. Myocare lenses are very effective in slowing the progression of myopia without any side effects, with high tolerability. Gender did not significantly affect the outcomes.

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