

VISUAL ACUITY ASSESSMENT WITH ATROPINE PENALIZATION VS PARTIAL OCCLUSION THERAPY IN AMBLYOPIA PATIENTS IN SOUTH PUNJAB

MUZAMIL M*, MAJEED B, ATTAULLAH, RAO MRQ, TAYYAB F, BATOOL H

Department of Ophthalmology, Nishtar Medical University and Hospital (NMU & H) Multan, Pakistan

*Correspondence author email address: drmuzammil1231@yahoo.com

(Received, 27th August 2023, Revised 20th November 2023, Published 31st December 2023)

Abstract: A retrospective study was conducted in the Ophthalmology Department of Nishtar Medical Hospital from September 2022 to September 2023 to compare the effectiveness of atropine penalization and occlusion therapy in treating amblyopia in children. The study included 50 children aged 2-9 years with no prior treatment history of amblyopia. The children were divided into two groups: Group A received atropine penalization, while Group B received occlusion therapy. Both groups had a mean age of 5.5 years, and all patients passed the visual acuity tests. Strabismus was high in both groups, with 96% in Group A and 92% in Group B. The treatment duration in Group A was 7.5 months on average, while it was 4.5 months in Group B. Treatment compliance was higher in Group A (96%) compared to Group B (68%). After the treatment, the atropine group had a visual acuity range of 6/6 to 6/60, with a mean visual acuity of 6/10. On the other hand, the occlusion group had a visual acuity range of 6/6 to 6/120, with a mean visual acuity of 6/20. The study concluded that atropine penalization had better patient outcomes and compliance in treating amblyopia in pediatric patients. The study concluded that atropine penalization had better patient outcomes and compliance in treating amblyopia in pediatric patients.

Keywords: Penalization, Atropine, Occlusion, Amblyopia

Introduction

Vision problems in children are often caused by amblyopia. It occurs in 3-5% of children from birth to seven years old. (Sen et al., 2022) Occlusion of the dominant eye is the most common treatment for this condition to stimulate the affected eye and use it during waking hours. (Papageorgiou et al., 2019) Pharmacological penalization is also an effective alternate treatment for amblyopia. This method is performed by instilling cycloplegic agents such as atropine daily in the dominant eye, forcing the use of the amblyopic eye for visual tasks. (Vagge et al., 2020)

Pharmacological penalization is not a common practice, and often, occlusion is preferred as the primary treatment of amblyopia. However, the effectiveness of both treatments in children has been satisfactory. Osborne et al. compared the visual outcomes of both procedures and reported 76% positive results in the atropine group. (Osborne et al., 2018) Another study conducted on 26 amblyopic children showed that 61.5% responded to the atropine treatment. (Sultan et al., 2022) In Pakistan, however, no study has been conducted to compare the treatment outcomes of atropine penalization and occlusion in children.

This study compared the efficacy of atropine penalization vs. occlusion therapy in pediatric patients with amblyopia.

Methodology

A randomized control trial was conducted in the Ophthalmology Department of Nishtar Medical Hospital from September 2022- September 2023. Fifty amblyopic children (2-9 years old), selected from south Punjab, with no prior treatment history of amblyopia were selected for the study. Patients were divided into two groups: A and B. Group A was treated with atropine penalization, and group

B was administered occlusion therapy. All the patients' guardians gave informed consent to include the child in the study. The hospital's ethical committee approved the study design. In Group A, one drop of 0.5% atropine was instilled twice weekly into the fornix of the non-amblyopic eye. In Group B, an occlusion patch was placed daily on the dominant eye for a specific time that was determined depending upon the extent of amblyopia and age of the patient. Visual acuity was checked at every visit, and if the vision recovered to 6/9 or more, the patient was shifted to part-time occlusion to prevent occlusion amblyopia.

Patient data was collected, including age, ocular history, family ophthalmic history, visual acuity, amblyopia type, and refractive error. Visual acuity was assessed by Kay's pictures, Snellen chart, or Sheridan-Gardner test types where appropriate according to age and understanding of the child. Two observers, blinded to patient treatment, assessed acuity at every visit; the average reported acuity was considered. Refractive error was determined after 35 minutes of administration of cyclopentolate 1% by using cycloplegic retinoscopy. Data regarding these factors was noted on 1st visit, after treatment, and after follow-up. Treatment was completed after achieving 6/6 of visual acuity or constant acuity results after three consecutive visits. Monthly follow-up visits were done to assess tolerance and compliance to treatment. Patients were also checked for adverse effects such as photosensitivity and allergy.

All the data was analyzed using SPSS version 23. The mean and logarithm of each visual acuity were calculated and compared by t-tests. Mean acuity was calculated by converting the antilog of the geometric mean to Snellen notation. A p-value of <0.001 was regarded as significant.

[Citation: Muzamil, M., Majeed, B., Attaullah., Rao, M.R.Q., Tayyab, F., Batool, H., (2023). Visual acuity assessment with atropine penalization vs partial occlusion therapy in amblyopia patients in south Punjab *Biol. Clin. Sci. Res. J.*, 2023: 637. doi: <https://doi.org/10.54112/bcsrj.v2023i1.637>]

Results

The mean age in both groups was 5.5 years. All patients passed the tests for visual acuity. Strabismus was 24 (96%) in Group A and 23 (92%) in Group B. Treatment in Group A patients lasted for 7.5 months and in Group B for 4.5 months. Treatment compliance was 96% vs 68% in both groups (Table I).

Table I: Patients' baseline characteristics

Variables	Group A (n=25)	Group B (n=25)
Average age (years)	5.5	5.5
Strabismus	24 (96%)	23 (92%)
Anisometropia	23 (92%)	19 (76%)
Mean spherical error	+5.5 diopters	+4.5 diopters
The average duration of treatment	7.5 months	4.5 months

Table II: Mean Visual acuity.

Group	Before Treatment (Mean \pm Range)	After Treatment (Mean \pm Range)	P-value
Group A	20/160 (20/60 - 20/200)	20/60 (20/40 - 20/150)	<0.001
Group B	20/200 (20/60 - 20/200)	20/80 (20/40 - 20/160)	<0.001

Discussion

This study aimed to compare the treatment outcomes of occlusion therapy and atropine penalization in amblyopic patients. The primary outcome of treatment is restoration of visual acuity in the amblyopic eye and prevention of disease recurrence. Occlusion therapy is frequently used to treat the disorder; however, it is not suitable for all amblyopic children due to side effects. (Shoshany et al., 2020) Penalization is an alternative treatment that limits the acuity of the dominant eye by cycloplegic agents. This method was initially discovered by Worth, who reported the improvement in acuity in the amblyopic eye after the instillation of atropine in the dominant eye. (Li et al., 2020) This method has shown successful results in several studies globally. (Elhusseiny et al., 2020; Li et al., 2019)

In our study, atropine resulted in recovery of visual acuity in all patients, and no side effects were reported. The guardians of the patients were urged to continue further treatment in the hope of better outcomes. However, in the occlusion therapy group, the treatment was not accepted readily, and many patients terminated the treatment. (Le and Öge, 2022) As shown by the results, the mean duration of treatment in the atropine group was 7.5 months, and in the occlusion group was 4.5 months only.

By the end of treatment, patients in the atropine group recovered a mean visual acuity of 6/10 in the amblyopic eyes. In comparison to this, occlusion therapy could recover an acuity of 6/20. This difference in groups was statistically significant ($p < 0.001$). Hence, treatment of amblyopia with atropine is better concerning patient outcome and satisfaction. Other studies have shown similar results. (Vagge et al., 2020; Varma et al., 2021; Wang et al., 2021)

Another advantage of atropine treatment over occlusion is tracking patient compliance. With atropine use, the patient has fixed dilated pupils, which can be checked easily. This is not the case in occlusion therapy due to the patching. This disadvantage of occlusion therapy has also been reported in other studies. (Findlay et al., 2019; Shetty and Prathyusha, 2019; White and Walsh, 2022)

The visual acuity ranged from 20/60 to 20/200 in the amblyopic eyes before treatment, with a mean of 20/160 in group A and 20/200 in group B. After the treatment, acuity ranged from 20/40 to 20/150 in the atropine group, with a mean visual acuity of 20/60. In the occlusion group, acuity was between 20/40 and 20/160 with a mean acuity of 20/80 (Table II). The improvement of acuity after treatment in both groups was significant.

Since the atropine treatment could be completed and was carried out for a long time, satisfactory results were noted. (Steel et al., 2019) The occlusion treatment in many patients was terminated before time; hence, the deterioration of effect leads to less satisfactory results and recovery of visual acuity. (Bhola et al., 2006) While in atropine treatment, treatment was only discontinued when 6/6 acuity was recovered or when acuity was unchanged in three consecutive visits, ensuring the best possible results. No side effects or sensitivity was reported in patients after prolonged use of atropine. Atropine toxicity has been negligible in other studies conducted on the use of atropine for visual disorders. Therefore, better outcomes and patient compliance are improved with the use of atropine in pediatric patients. (Wang, 2022)

Conclusion

Atropine penalization shows better patient outcomes and compliance in pediatric patients with amblyopia.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

Approved by the department Concerned.

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

MUHAMMAD MUZAMIL

Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript

BILAWAL MAJEED

Development of Research Methodology Design, Study Design, Review of manuscript, Coordination of collaborative efforts, final approval of manuscript.

ATTAULLAH

Manuscript revisions, critical input. drafting article
Data acquisition and analysis.

MUHAMMAD RASHAD QAMAR RAO

Data acquisition, analysis, drafting article. Data acquisition, analysis, drafting article, Data acquisition, analysis, Coordination of collaborative efforts.

FATIMA TAYYAB

Data entry and Data analysis, drafting article, Data acquisition, analysis, Coordination of collaborative efforts.

HIRA BATOOL

drafting article, Data acquisition

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