Original Article

Effects of Patching in the Treatment of Anisometropic Amblyopia in Adults: A Clinic-Based Cohort Study

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Abstract

Purpose: To assess the efficacy of patching therapy in adults with unilateral anisometropic amblyopia.
Patients and Methods: This study was conducted in Noida, India, from August 2023 to May 2024, and involved 28 adults with unilateral anisometropic amblyopia. Participants were required to be at least 18 years old, have a spherical equivalent of less than - 3.00 D, best-corrected visual acuity (BCVA) between 0.3 logMAR and 1.0 logMAR in the amblyopic eye, and BCVA of 0.2 logMAR or better in the fellow eye. Participants underwent cycloplegic refraction and were prescribed corrective spectacles to wear for one month. If no improvement was observed, patching treatment was initiated, consisting of 3 hours of daily occlusion for 8 weeks. Visual acuity was assessed at the beginning and end of the treatment.
Results: Out of 28 patients, 26 patients (92.86 %) showed improvement in visual acuity after 6 weeks of patching therapy, while 2 patients (7.14 %) did not. In the 18-20 age group all patients showed improvement, in the 21-23 age group 92.86 % of patients improved, and in the 24 years-and-above age group 50 % of patients showed improvement. The overall mean visual improvement was 1.03 ± 0.94 lines on the logMAR chart.
Conclusion: The study results suggest that patching therapy might improve visual acuity in adults with unilateral anisometropic amblyopia. While the results indicate the potential for patching therapy beyond childhood, the limited sample size highlights the need for larger studies to confirm these findings.

Keywords: Anisometropic Amblyopia; Patching Therapy; Visual Acuity.

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Introduction

Reduced vision in one or both eyes is a defining feature of amblyopia without any structural ocular abnormalities, often attributed to inefficient neuronal connections between the eye and the cortical pathways [1]. This condition typically develops during childhood, throughout the crucial stage of visual development. Amblyopia has a global prevalence ranging from 0.2 % to 6.2 % [2]. For example, the Avon Longitudinal Study of Parents and Children (ALSPAC) conducted in the United Kingdom found that 1 in 30 children at the age of 7 had amblyopia [3].

According to recent research, amblyopia is more common in northern India, though it s prevalence varies significantly among the population. One population-based observational study found a prevalence rate of 0.41 %, while other studies reported prevalence rates ranging from 0.2 % to 7.4 % [4-6]. Hospital-based studies consistently show that amblyopia is particularly common in children with refractive errors, indicating it as a public health concern that necessitates further investigation and management.

Amblyopia can be categorized into three primary types based on its underlying causes: strabismic amblyopia, deprivation amblyopia, and anisometropic amblyopia. Strabismic amblyopia arises from misalignment of the eyes [7], while deprivation amblyopia results from insufficient visual stimulation [8]. Anisometropic amblyopia is caused by unequal refractive errors between the two eyes [9].

While various treatment approaches have been employed in the past, patching therapy remains the most common. This therapy involves occluding the stronger eye to strengthen the weaker eye by restricting visual input from the dominant eye. It was previously believed that only children under the age of eight would benefit most from patching treatment. However, recent studies have shown that although early treatment is generally presumed to be more effective, amblyopia can also improve in older patients due to neural plasticity [10]. The purpose of this study was to assess the efficacy of patching therapy in adults with amblyopia and to determine the time frame within which maximum benefit from the therapy is achieved.

Patients and Methods

The research was conducted in Noida, Uttar Pradesh, India, from August 2023 to May 2024. Participants were referred from various health clinics, multi-specialty hospitals, and district hospitals. Initially, an ophthalmologist at the clinic conducted a screening, which included a review of systemic and ocular history, as well as an examination of both the anterior and posterior segments of the eyes to rule out any underlying pathology. Prior to any vision assessments, participants or their guardians provided informed consent. Approval for the study was obtained from the ethics committee of Visifert Eye Hospitals, ensuring adherence to ethical guidelines in accordance with the Declaration of Helsinki.

A convenience sampling method was used to meet the study's inclusion criteria and time constraints, resulting in the recruitment of 28 participants with amblyopia. The inclusion criteria included participants aged 18 years or older, with unilateral amblyopia of the anisometropic type and a spherical equivalent of less than - 3.00 D, or refractive amblyopia with a best-corrected visual acuity between 0.3 logMAR and 1.0 logMAR in the amblyopic eye and 0.2 logMAR or better in the fellow eye. Participants with no prior amblyopia therapy or eye surgery were included. Only those participants whose parents agreed to

fully cooperate with the prescribed therapy were included.

Participants underwent cycloplegic refraction and were provided with corrective spectacles, which they wore for one month before starting patching treatment. Treatment commenced only if no vision improvement was observed after one month of spectacle use. Participants were required to visit the clinic monthly, but only data from the first and last visits were analyzed and discussed. The occlusion treatment involved patching the better eye for three hours daily while engaging in stimulating activities such as reading, writing, and drawing. The treatment continued for eight weeks. Participants or their guardians were given written instructions and a recording sheet to document the number of occlusion treatments was administered.

Statistical Analysis

The study variables were documented using MS Excel 2019. Descriptive statistics, including mean and standard deviation (SD), were used to compare pre- and post-patching visual acuity. Due to the limited sample size, results were discussed descriptively, and no inferential statistical analysis was conducted.

Results

A total of 28 patients participated in the study, all of whom completed the prescribed treatment regimen. The age-wise distribution of the subjects is shown in figure 1.

Of the 28 adult participants, after six weeks of patching treatment vision improved in 26 patients (92.86 %) and did not improve in 2 patients (7.14 %), as illustrated in figure 2.

Age wise visual acuity improvement is shown in table 1. As observed in this table all patients in 18-20 years age group (12 patients) showed improvement. In the 21-23 age group 92.86 % of patients improved, and in the 24 years-and-above age group 50 % of patients showed improvement.

The mean visual improvement was calculated, with the minimum improvement considered as no change and the maximum improvement

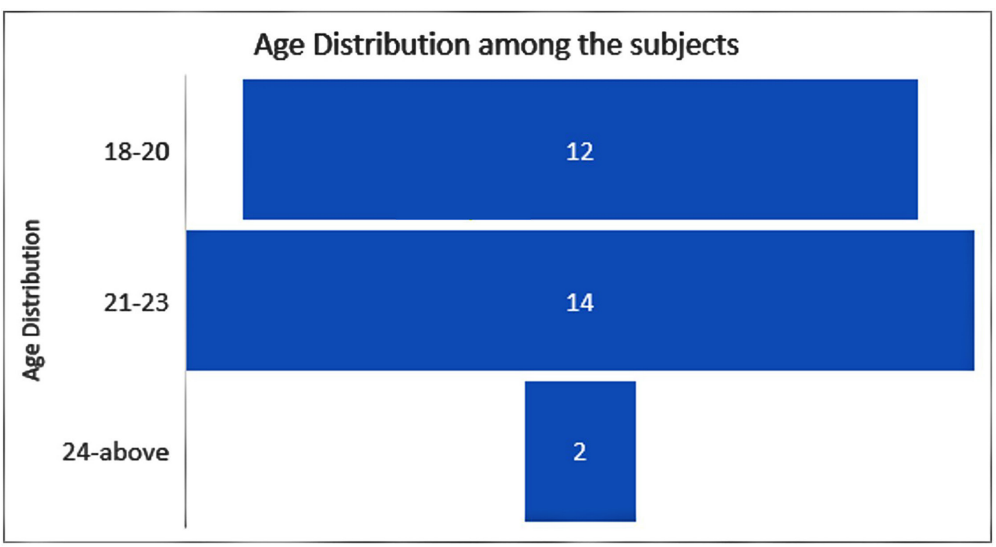

Figure 1: Age-wise distribution of patients with amblyopia

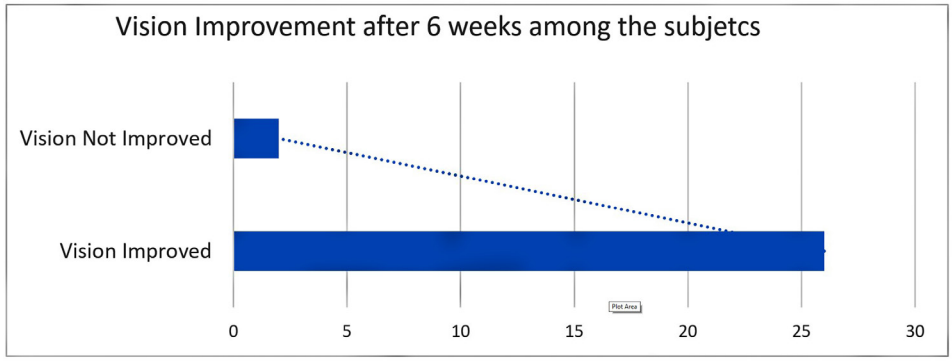

Figure 2: Shows the improvement in visual acuity in the amblyopes after 6 weeks of continuous patching

being 3 lines on the log Mar chart after 6 weeks of patching. The mean ± SD of visual improvement in the adult group after 6 weeks of patching therapy was found to be 1.03 ± 0.94, as shown in table 2.

Descriptive statistics and graphical representations indicated that adults experienced clinically significant improvement with patching therapy during the first six weeks of treatment.

Table 1: Age wise visual acuity improvement percentile among patients after 6 weeks

Age Group	Vision Improved (%)	Vision Not Improved
18-20	12 (100 %)	0
21-23	13 (92.86 %)	1 (7.14 %)
24 and above	1 (50 %)	1(50 %)

Table 2: Age-wise mean improvement in visual acuity among patients with amblyopia

Age Group	Number of subjects	Mean Visual Improvement
18-20	12	1.07 ± 0.76
21-23	14	1.05 ± 0.84
24 and above	2	1.02 ± 0.92
Total	28	1.03 ± 0.94

Discussion

Penalization with patching therapy has been a management modality for amblyopia for the past 250 years [11]. Before starting patching therapy, it is crucial to correct any refractive error, as this enhances the efficiency and effectiveness of the therapy [12]. Traditionally, it was believed that treating amblyopia was only effective if started before age seven due to concerns regarding the critical stage of visual development and potential severe visual impairment [13]. However, current research indicates that cortical plasticity, although diminished, persists until around age 50 [14]. Previously, it was suggested that adults require a longer duration of patching per day, which can affect patient compliance [15].

This study aimed to analyze visual improvement in adult participants with a consistent patching schedule. In this study, the authors focused on adult groups with unilateral anisometropic amblyopia to maintain a feasible four-hour daily patching schedule. After eight weeks of occlusion therapy, significant visual improvement was observed.

Recent advances have introduced binocular iPad therapy for treating amblyopia, using red-green anaglyphic glasses to view dichoptic stimuli [16]. The Pediatric Eye Disease Investigator Group (PEDIG) conducted a study comparing binocular video games with patching therapy, finding no statistically significant difference in visual improvement between the two groups after 16 weeks [17]. In older children this study showed low visual improvement in the binocular video game group due to poor compliance [17]. Research continues to explore new treatment methods for amblyopia, but results remain comparable to traditional occlusion therapy [18]. A 2019 study showed that combining passive dichoptic movie viewing with occlusion therapy in adults led to greater visual improvement than dichoptic stimuli alone, with longer-lasting effects and a lower likelihood of amblyopia recurrence [19].

Amblyopia is considered a neurodevelopmental disorder, resulting in decreased vision and impaired binocular visual function. The brain suppresses the image from the amblyopic eye, causing monocular blindness. Anisometropic amblyopia is more common in older children (3-15 years), highlighting the need to screen this age group for uncorrected refractive errors [20].

While patching therapy aims to improve vision in the amblyopic eye, amblyopic patients lack binocular single vision, including stereopsis development. Consequently, treatment should address all aspects of binocular vision and not just focus on improving eyesight.

The main limitations of this study include its small sample size, lack of a control group, absence of long-term follow-up, and reliance on descriptive rather than inferential statistical analysis, all of which limit the generalizability of the findings and warrant further research with larger, more robustly designed studies.

Conclusion

The study results suggest that patching therapy might improve visual acuity in adults with unilateral anisometropic amblyopia. While the results indicate the potential for patching therapy beyond childhood, the limited sample size highlights the need for larger studies to confirm these findings.

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References

1. Bui Quoc E, Kulp MT, Burns JG, Thompson B. Amblyopia: A review of unmet needs, current treatment options, and emerging therapies. Surv Ophthalmol. 2023 ;68(3):507-25.

2. Mocanu V, Horhat R. Prevalence and Risk Factors of Amblyopia among Refractive Errors in an Eastern European Population. Medicina (Kaunas). 2018;54(1):6.

3. Williams C, Northstone K, Howard M, Harvey I, Harrad RA, Sparrow JM. Prevalence and risk factors for common vision problems in children: data from the ALSPAC study. Br J Ophthalmol. 2008;92(7):959-64.

4. Pant K, Khan S, Bansal R. Prevalence of persistent refractive amblyopia amongst school-children in North India: a population-based observational study of childhood visual deficit and its correlation with heterophoria & NPC. International Journal of Research and Review. 2021;7(9):11-6.

5. Prateeksha, Tripathi A, Adak P. Assess the Awareness and Attitude about Amblyopia in North-Western Universities and Colleges academicians of India. Asian J Med Health Res. 2022;7(03):1-11.

6. Kelkar J, Kelkar A, Thakur P, Jain HH, Kelkar S. The epidemiology and disease pattern of pediatric ocular morbidities in Western India: The National Institute of OphthalMology AmBlyopia StUdy in Indian Paediatric EyeS (NIMBUS) study report 1. Indian J Ophthalmol. 2023;71(3):941-5.

7. Tdf. Handbook of Pediatric Strabismus and Amblyopia. Kenneth W Wright, M.D., Peter H Spiegel, M.D., and Lisa S Thompson, M.D., Editors Springer, New York, NY, 2006, 576 pages, 210 illustrations, Am Orthopt J. 2006;56:200-1.

8. Angell LK, Robb RM, Berson FG. Visual prognosis in patients with ruptures in Descemet's membrane due to forceps injuries. Arch Ophthalmol. 1981;99(12):2137-9.

9. Weakley DR Jr. The association between nonstrabismic anisometropia, amblyopia, and subnormal binocularity. Ophthalmology. 2001;108(1):163-71.

10. Wong AM. New concepts concerning the neural mechanisms of amblyopia and their clinical implications. Can J Ophthalmol. 2012;47(5):399-409.

11. Park SH. Current Management of Childhood Amblyopia. Korean J Ophthalmol. 2019 Dec;33(6):557-68.

12. de Zárate BR, Tejedor J. Current concepts in the management of amblyopia. Clin Ophthalmol. 2007;1(4):403-14.

13. Gopal SKS, Kelkar J, Kelkar A, Pandit A. Simplified updates on the pathophysiology and recent developments in the treatment of amblyopia: A review. Indian J Ophthalmol. 2019;67(9):1392-9.

14. Wallace DK, Lazar EL, Crouch ER 3rd, Hoover DL, Kraker RT, Tamkins SM, et al. Time course and predictors of amblyopia improvement with 2 hours of daily patching. JAMA Ophthalmol. 2015;133(5):606-9.

15. Kraus CL, Culican SM. New advances in amblyopia therapy I: binocular therapies and pharmacologic augmentation. Br J Ophthalmol. 2018;102(11):1492-6.

16. Holmes JM, Manh VM, Lazar EL, Beck RW, Birch EE, Kraker RT, et al. Effect of a Binocular iPad Game vs Part-time Patching in Children Aged 5 to 12 Years With Amblyopia: A Randomized Clinical Trial. JAMA Ophthalmol. 2016;134(12):1391-400.

17. Manh VM, Holmes JM, Lazar EL, Kraker RT, Wallace DK, Kulp MT, et al. A Randomized Trial of a Binocular iPad Game Versus Part-Time Patching in Children Aged 13 to 16 Years With Amblyopia. Am J Ophthalmol. 2018;186:104-15.

18. Wallace DK, Repka MX, Lee KA, Melia M, Christiansen SP, Morse CL, et al. Amblyopia Preferred Practice Pattern®. Ophthalmology. 2018 Jan;125(1):P105-42.
19. Al-Haddad C, Ismail K, Jurdi KW, Keaik M. Clinical Profile and Treatment Outcomes of Amblyopia Across Age Groups. Middle East Afr J Ophthalmol. 2019;26(2):71-6.
20. Piano MEF, Simmers AJ. 'It's too late'. Is it really? Considerations for amblyopia treatment in older children. Ther Adv Ophthalmol. 2019;11:2515841419857379.

Footnotes and Financial Disclosures

Conflict of interest:

The authors have no conflict of interest with the subject matter of the present manuscript.