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Original Research

Effectiveness of Part Time Occlusion Therapy in Moderate Amblyopia-A Hospital Based Prospective Observational Study in South Kerala

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ABSTRACT

Background: Amblyopia is a disorder of visual deprivation or dysfunction of the processing of visual information [(1)].The optimal treatment for amblyopia depends on the patient's age at the time of diagnosis, the onset and type of amblyopia, and the degree of compliance attainable.

Objectives: To study the demographic characteristics and improvement in visual acuity after part time occlusion treatment and the type of amblyopia with better visual improvement in children aged 5-12 years with moderate amblyopia.

Methodology: All children aged 5-12 years with unilateral moderate amblyopia attending outpatient department and Paediatric ophthalmology clinic of a Tertiary eye care hospital in South Kerala who gave consent to participate in the study were included. Detailed history, demographic data were collected. Best corrected visual acuity (BCVA) was measured using Snellen's chart. Detailed evaluation of strabismus, binocular single vision assessment, cycloplegic refraction using Atropine or Cyclopentolate and posterior segment examination were performed. Appropriate refractive correction was prescribed to amblyopic children 6 weeks prior to enrolment. Part time occlusion of the nonamblyopic eye for two hours per day combined with 1 hour of near activity was prescribed to all patients and followed up two monthly up to 6 months.

Results: 50 patients with unilateral moderate amblyopia were studied. Mean age of the study population was 7.7 ± 0.463 years. Females were predominant and accounted for 60% of the study population. Hypermetropia (53%) was the commonest refractive error noted. Strabismus was present in 62% of patients and anisometropia was in 54% patients. 76% patients had binocular single vision at presentation. Mean visual acuity of study population at presentation was 0.343 LogMAR units which has improved to 0.131 LogMAR units by the end of the study. Strabismic amblyopia showed maximum improvement in visual acuity compared to anisometropic amblyopia during study period.

Conclusion: Part time occlusion is a viable and effective modality of management of amblyopia in Indian patients. Strabismic amblyopia was the commonest type and responded best to the occlusion therapy.

Key Words: Moderate Amblyopia, Part Time Occlusion, Compliance, Binocularity, Efficacy.

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INTRODUCTION

Amblyopia is defined as the 'unilateral or bilateral decrease of best-corrected visual acuity caused by form deprivation, abnormal binocular interaction or both, for which no organic cause can be detected by physical examination of the eye and which in appropriate cases is reversible by therapeutic means at the appropriate time.' [(2)]The American Academy of Ophthalmology considers amblyopia an interocular difference of two lines or more in visual acuity, or visual acuity worse than or equal to 20/30 with the best optical correction. [(3)] With an incidence of 3% to 6%, amblyopia is the most common cause of low visual acuity in children and adults in developed countries and has great economic and social impact. [(4-6)]

The main ocular alterations that predispose to amblyopia are deprivation of visual stimuli, alteration of visual stimuli by refractive changes (high ametropia and/or anisometropia), and non-corresponding images received by each eye (strabismus).

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Deprivation amblyopia can be due to congenital cataract, blepharoptosis, nystagmus disorders, optic nerve coloboma and hypoplasia, retinal disorders, persistent foetal vasculature. Other disease processes can also result in amblyopia. Its treatment is challenging, and results are generally less successful than in other forms of amblyopia [5,6,7]

Anisometropic amblyopia occurs when there is a difference in the state of refraction of at least 1 dioptre between 2 eyes.[8] Hypermetropicanisometropia is most likely to cause amblyopia, since the retina of the more ametropic eye never receives a clear and defined image.

The treatment options for amblyopia[9-13] are Refractive correction, Occlusion, Penalization, drug therapy, near visual exercises, Surgery to treat the cause of amblyopia, Refractive surgery, Television games/video/mobile games etc

In deprivation amblyopia, the cause of visual impairment (eg: cataract, ptosis) need to be treated first whereas anisometropic amblyopia requires prior refractive correction. In strabismic amblyopia, amblyopia should be treated first, followed by correction of strabismus. Best outcomes are achieved if amblyopia is treated before the age of 7 years.

The Amblyopia Treatment Study 2B compared patching for 2 hours and 6 hours in the treatment of moderate amblyopia. It was concluded that in moderate amblyopia, two hours patching gives similar results to six hours of patching, and prescribing a greater number of hours does not seem to have significantly beneficial effects during the first 4 months of treatment.

In this study we analyse the effectiveness of part time occlusion therapy along with optical correction for moderate amblyopia in children below 12 years in this part of south Kerala.

OBJECTIVES OF THE STUDY

Primary Objective: To determine the improvement in best corrected visual acuity (BCVA) at 6 months after part time occlusion treatment in children with moderate amblyopia.

Secondary objective

1. To study the type of amblyopia with better visual improvement.
2. To study the demographic characteristics in patients aged 5-12 years with moderate amblyopia.

MATERIALS AND METHODS

Methodology

A hospital based prospective observational study was conducted. All children aged 5-12 years with unilateral moderate strabismic amblyopia, anisometropic amblyopia or both, attending outpatient department and Paediatric ophthalmology clinic of a Tertiary eye care hospital in South Kerala, who gave consent to participate in the study were included. The duration of the study was one year. Newly diagnosed, treatment naïve amblyopes were recruited. A detailed history and demographic data were collected. Baseline clinical examination was performed. Best corrected visual acuity (BCVA) was measured using Snellen's chart and was then converted to LogMAR scale using standardized conversion tables. Detailed evaluation of strabismus including Ocular motility, Hirschberg Test, Cover Test, Prism Bar Cover Test was done. Binocular single vision was assessed using Titmus fly test and Bagolini striated glasses[14]. Cycloplegic refraction using Atropine (<5 years) or Cyclopentolate (>5 years) was performed. Posterior segment examination was performed using Slit lamp Biomicroscope with 90 D lens and Indirect Ophthalmoscope. Appropriate refractive correction was prescribed to amblyopic children 6 weeks prior to enrolment.

Part time occlusion of the nonamblyopic eye for 2 hours/day with an adhesive patch combined with one hour of near activity was prescribed to all patients. BCVA, compliance with occlusion therapy based on standard questionnaire, ocular alignment and binocularity were assessed at 2 monthly follow up visits up to 6 months. Increase in the visual acuity by one or more lines in Snellen's chart will be considered improvement.

Compliance assessment questionnaire
a. Is your child compliant with the recommended duration of patching?
b. Did your child apply the patch yesterday? If yes, for how many hours?
c. How many days in the last one week did your child miss the recommended duration of patching?
d. How many days since the last visit did your child miss the recommended duration of patching?

Sample Size

The sample size calculated was 40. Fifty patients have been included in this study. The data was entered in Microsoft excel sheet and statistical analysis was done using the statistical software SPSS version 20.

RESULTS

In 1 year, 50 patients with unilateral moderate amblyopia were studied.

$$N = \frac{(Z\alpha)^2 PQ}{d^2} \quad T$$

The age distribution of the study population was mostly along 5-8 years (70%) group. Mean age of the study population was 7.7 ± 0.463 years. Females were predominant and accounted for 60% of the study population. Among 35 children less than 8 years, twenty two (44%) were females and above 8 years group, eight(16%) were females.

Most children (24%) had birthweight between 2400 grams and 3500 grams. 22% (11) of them had very

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low birthweight(<1500g) whereas 4% children weighed >3500g at birth.

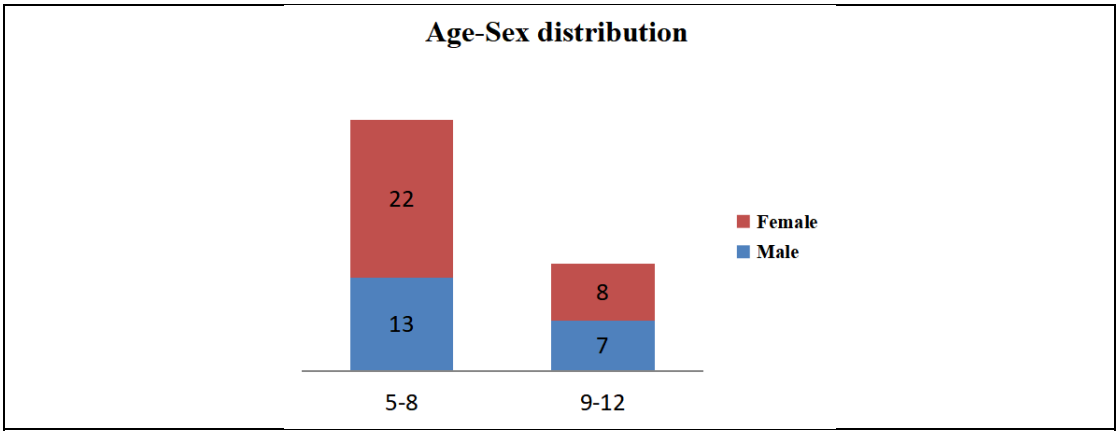

Figure 1: Distribution of age and sex in patients with moderate amblyopia

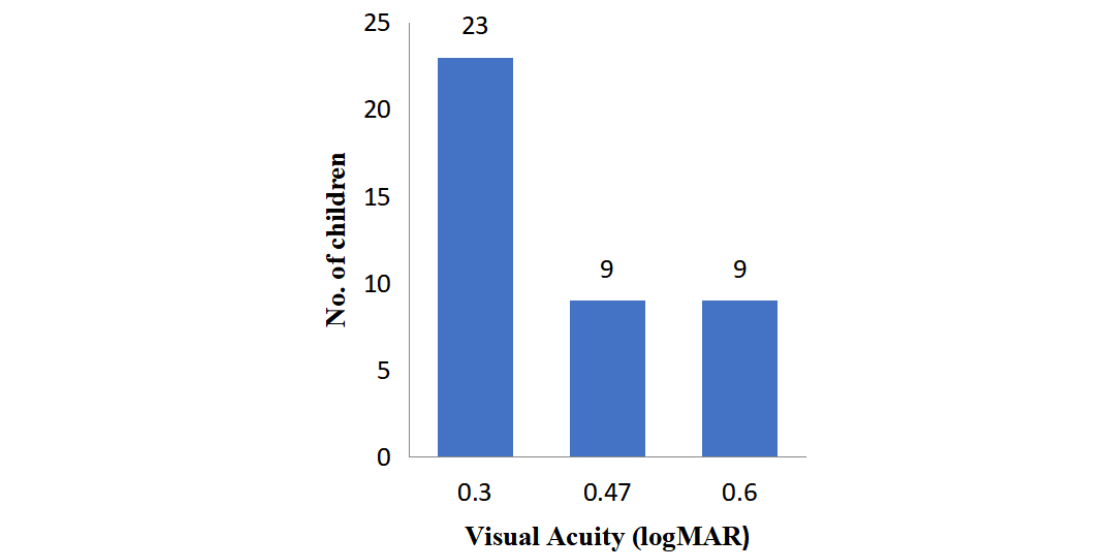

Figure 2: Best Corrected Visual acuity at presentation

As visual acuity is a single best indicator of efficacy of therapy, our primary outcome measure was best corrected visual acuity. 45% children presented with visual acuity of 0.3 LogMAR units. Visual acuity of 0.47 and 0.6 LogMAR units were equally distributed in study population (18% each). Mean visual acuity of study population at presentation was 0.343 LogMAR units. It has improved to 0.306 at 2 months, later to 0.236 at 4 months and finally 0.131 Log MAR units by the end of 6th month. Fortysix patients (92%) showed improvement in final visual acuity after 6 months of occlusion therapy.

The initial mean visual acuities of strabismic and anisometropic amblyopia patients were 0.370 and 0.334 LogMAR units, respectively. The final mean visual acuities of these patients at the conclusion of the study were 0.135 and 0.142 LogMAR units respectively. Mean visual acuity of strabismic amblyopia as well as anisometropic amblyopia had improved to 63.5% and 57.5% respectively by the end of the study as evidenced by increase in Snellen visual acuity by atleast one line.

Mean Visual Acuity	Strabismic amblyopia		Anisometropic amblyopia	
	Mean BCVA in LogMAR units	Improvement in BCVA (%)	Mean BCVA in LogMAR units	Improvement in BCVA (%)
At Presentation	0.370	-	0.334	-
At 2 months	0.337	8.9%	0.301	9.9%
At 4 months	0.257	30.5%	0.233	30.2%
At 6 months	0.135	63.5%	0.142	57.5%

Table 1: Distribution of mean visual acuity in moderate amblyopia

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BCVA in logMAR units		Type of Amblyopia		
		Strabismic amblyopia (n,%)	Anisometropic amblyopia (n,%)	Mixed amblyopia (n,%)
Initial	0	1 (3.2)	5 (18.5)	0 (0.0)
	0.18	3 (9.7)	1 (3.7)	1 (11.1)
	0.3	17 (51.6)	10 (37.0)	4 (44.4)
	0.47	4 (12.9)	6 (22.2)	1 (11.1)
	0.6	7 (22.8)	5 (18.5)	3 (33.3)
At 2 months	0	2 (6.4)	6 (22.2)	1(11.1)
	0.18	8 (22.8)	0 (0.0)	0(0.0)
	0.3	13 (41.9)	14 (51.9)	4 (44.4)
	0.47	2 (6.4)	2 (7.4)	1 (11.1)
	0.6	7 (22.8)	5 (18.5)	3 (33.3)
At 4 months	0	4 (12.9)	6 (22.2)	1 (11.1)
	0.18	17 (51.6)	10 (37.0)	4 (44.4)
	0.3	4 (12.9)	6 (22.2)	1 (11.1)
	0.47	5 (16.1)	4 (14.8)	2 (22.2)
	0.6	2 (6.4)	1 (3.7)	1 (11.1)
At 6 months	0	16 (50)	12 (44.4)	4 (44.4)
	0.18	7 (22.8)	7 (25.9)	1(11.1)
	0.3	3 (9.7)	5 (18.5)	2 (22.2)
	0.47	4 (12.9)	2 (7.4)	1 (11.1)
	0.6	2 (6.3)	1 (3.7)	1 (11.1)

Table 2: Visual Acuity of the study population

	Compliance with occlusion		Binocular single vision	
	Present(n)	Absent(n)	Present(n)	Suppression(n)
Initial	34	16	38	12
After 2 months	40	10	39	11
After 4 months	49	1	43	7
After 6 months	50	0	47	3

Table 3: Distribution of clinical features of the study population

Binocular single vision was initially present in 76% patients which improved to 94% of study population with occlusion therapy. [Table2]

Hypermetropia (53%) was the commonest refractive error noted in the study population followed by Astigmatism (27%) and Myopia (20%) [Figure 3]

Based on standard questionnaire, compliance with occlusion was evaluated. 68% children had good compliance at presentation. The only child who was noncompliant at 4 months became compliant with occlusion at next visit (6 months.) [Table2]

Thirty-one children (62%) had strabismic amblyopia and 27 (54.0%) had anisometropic amblyopia. Eight children (25%) had a combination of strabismic and anisometropic amblyopia. Exotropia was present in 23 children and esotropia in eight. Ocular deviation less than 15 prism diopters was seen in 22(44%) patients. Ocular deviation was 15-30 prism diopters in 7(14%) patients and 30-45 D for two of them (4%).

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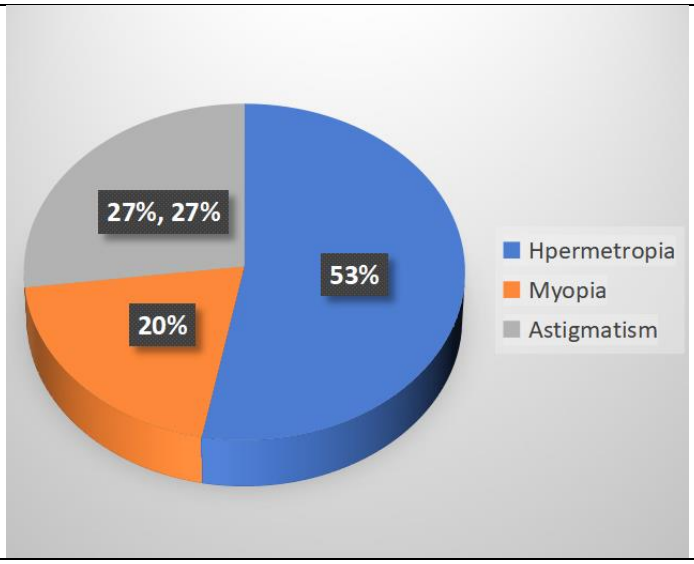

Figure 3: Distribution of refractive error in the study population

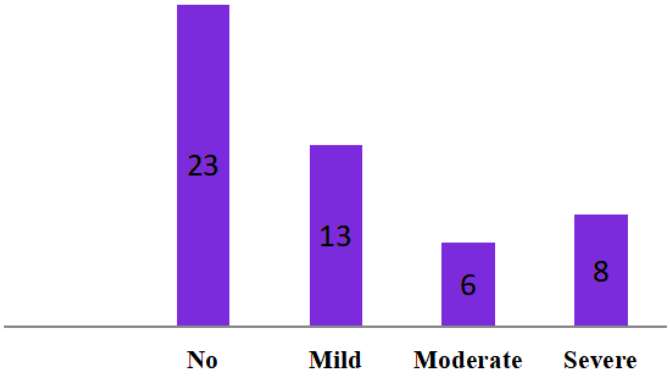

Figure 4: Degree of anisometropia in patients with moderate amblyopia

Few statistical tests were applied to check the association between best corrected visual acuity and the type of amblyopia. A Chi-square test of independence was applied to study these two. Statistically significant association existed between strabismic amblyopia and its visual acuity at presentation (P=0.045) in this study. Association between anisometropic amblyopia and the visual acuity at two months was also found to be statistically significant (P=0.012)

Compliance to occlusion is associated significantly with binocularity at initial time of observation, at 2 months and at 4 months of observation(P=0.000). No statistically significant association is found at 6 months of observation (P=0.426).

DISCUSSION

In this prospective observational study, we evaluated the effectiveness of part time occlusion in different types of amblyopia. We also analyzed demographic characteristics and the clinical features in patients with moderate amblyopia. In this study, the female population was predominantly affected with a male-to-female ratio of 1:3 with the mean age 7.7 ± 0.463 years. This is comparable with a hospital-based cross-sectional study conducted by Eslayeh et al.[15]

The commonest type of amblyopia in our study was strabismic type. Hypermetropia was the commonest refractive error in our study population which is in par with another hospital based study conducted in north India.[16]

After 6 months of occlusion therapy, all groups showed an improvement in the visual acuity. This improvement being maximum in the strabismic type of amblyopia. This contrasts with the majority of published literature from the west[17,18] and also from same geographic as our [19] where a similar level of visual impairment was found irrespective of the cause

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of amblyopia. Brar et al [20] have reported a substantial improvement in visual acuity uniformly for strabismic, anisometropic or a combination of strabismic and anisometropic amblyopia. The authors observed improvement in visual acuity in 98.7% of children whereas our study showed 92% improvement in final visual acuity.

Poor compliance in patients affects the efficacy of occlusion therapy. The compliance rates and thus response to treatment in our study matches with various other studies[16]

LIMITATIONS

The limitations of the study include its smaller sample size and shorter follow-up. Thus, they are liable to sampling errors and are difficult to extrapolate the results to general population. Moreover, it does not address the issue of maintenance therapy and the recurrence of treated amblyopia in moderate amblyopia. Sampling in a tertiary eye care centre may not represent the entire population. Large sample size may be needed to get more statistically significant results.

CONCLUSION

The present study suggests a beneficial effect of part-time occlusion therapy in moderate amblyopia. Following a period of refractive adaptation, part time occlusion according to the guidelines by the Pediatric Eye Disease Investigator Group works efficiently in India. Larger studies with longer follow-up are needed to address issues with extent of improvement with part-time occlusion.

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