

## Part-time occlusion therapy for amblyopia in older children

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### Abstract

**Aim:** To determine the outcome of part-time occlusion therapy in children aged 7-12 years with anisometropic amblyopia. **Material and Methods:** A prospective interventional study was conducted in which we analyzed 25 patients aged 7-12 years of age with anisometropic amblyopia. The patients whose best-corrected visual acuity (BCVA) did not improve by two lines or better within 2 weeks of wearing glasses full-time were prescribed occlusion therapy for 6 hours a day outside of school hours, along with the instruction to wear glasses full-time. Patients who complied with occlusion for more than 3 hours a day were considered to comply well. **Results:** The major component of the anisometropia was hyperopia in 15 patients (60 %) and hyperopic astigmatism was found in 6 patients (24 %). The mean pretreatment BCVA 0.16 (Log MAR) and post-treatment BCVA 0.23 (Log MAR). Post treatment visual acuity was measured at completion of 6 months and was compared with pre-treatment visual acuity using paired t-test. The results showed significant visual improvement with p value <0.00001. **Conclusion:** The most common component of anisometropia detected after 7 years of age was hyperopia. The part-time occlusion therapy, which had been carried out after school hours, was successful in most cases.

**Key Words:** Anisometropic, amblyopia, part-time occlusion, astigmatism

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### I. Introduction

Amblyopia, often called "lazy eye," is a decrease in visual acuity resulting from abnormal visual development in infancy and early childhood. The vision loss ranges from mild (worse than 20/25) to severe (legal blindness, 20/200 or worse). Although generally unilateral, amblyopia may affect both eyes. No apparent cause for the decreased vision can be detected on physical examination: the cornea, lens, retina, and optic disc are normal. Amblyopia is a major public health problem with an estimated prevalence of 1 to 4 percent in the United States.<sup>1</sup> It is the most common cause of monocular vision loss in children and young adults.<sup>2</sup> Early recognition and prompt referral are crucial, especially during infancy and childhood, to prevent permanent loss of vision. Several conditions may lead to amblyopia. Strabismus (i.e., ocular misalignment or heterotropia) causes the images on the retinas to be dissimilar; uncorrected refractive errors (i.e., anisometropia) or an impediment to the visual axis (e.g., cataracts) causes the images to be of unequal clarity. This displacement or distortion of the image prevents the development of fine visual perception in the occipital cortex and puts the child at risk for developing amblyopia. Occlusion therapy with patching of the non-amblyopic eye has long been the mainstay of amblyopia treatment<sup>3,4</sup>. Initially it was a common belief that occlusion therapy should be prescribed for full time, and that removing the patch even for a short period of time would lead to loss of all the benefit of previous patching. Recently, various amblyopia treatment groups have started to look into the efficacy of part-time occlusion.<sup>5-9</sup>

The opinion that amblyopia treatment may be ineffective in older children stems from the fact that the age of six to seven years is thought to be the end of the "critical period" for visual development in humans<sup>10</sup>. PEDIG<sup>11</sup> found that for amblyopia treatment in patients aged 7-12 years, augmenting the optical correction with patching therapy of two to six hours daily doubled the treatment responder rate to 53%. The aim of the study was to determine the outcome of part-time occlusion therapy in children aged 7-12 years with anisometropic amblyopia.

**Table 1:** Age distribution of patients

Age (in years)	Number (Male/Female)
7	6 (3/3)
8	10 (7/3)
9	2 (2/0)
10	5 (2/3)
12	2 (0/2)

**Table 2:** Distribution of Refractive errors in patients

Refractive Error	Number(%)
Myopic	2 (8%)
Myopic astigmatic	2 (8%)
Hyperopic	15 (60%)
Hyperopic astigmatic	6 (24%)

**Table 3:** Pretreatment BCVA of amblyopic eye (LogMAR)

Pretreatment BCVA LogMAR	Number (%)
0.2	2 (8%)
0.3	4 (16%)
0.5	7 (28%)
0.8	3 (12%)
1.0	4 (16%)
1.3	5 (20%)

**Table 4** Post treatment BCVA of amblyopic eye (LogMAR)

Post treatment BCVA LogMAR	Number(%)
0.0	3(12%)
0.2	14(56%)
0.3	8(32%)

**Table 5:** BCVA of amblyopic eye Pre Treatment and Post Treatment (Log MAR)  
Paired t-test (p value <0.00001)

Patient S.No.	Pre Treatment BCVA	Post Treatment BCVA
1	0.2	0.2
2	0.3	0.2
3	0.5	0.2
4	0.5	0.2
5	1.3	0.2
6	0.3	0.2
7	0.8	0.0
8	1.0	0.3
9	1.0	0.3
10	0.2	0.2
11	0.5	0.2
12	0.5	0.2
13	0.3	0.2
14	1.3	0.0
15	1.3	0.0
16	0.8	0.3
17	1.0	0.3
18	0.8	0.2
19	1.0	0.3
20	0.3	0.2
21	0.5	0.3
22	0.5	0.3
23	0.5	0.2
24	1.3	0.3
25	1.3	0.2

## II. Material & Methods

A prospective interventional study was conducted in which we analyzed 25 patients aged 7-12years of age with anisometropic amblyopia who had not had any ophthalmic treatment, who did not show any symptom of strabismus, who had never worn glasses before, and whose BCVA in their sound eye LogMAR=0.0 were selected. An ophthalmic examination including visual acuity, slit-lamp biomicroscopy, manifest and cycloplegic refraction, an alternate prism cover test, a test of versions/ductions and a fundus examination was given in each patient. At the initial prescription, full astigmatic refractive errors were corrected and in each case spherical diopters were adjusted to the lens power that correspond to the patient's best-corrected visual acuity after full cycloplegic correction in a trial frame. All visual acuities were transposed to the logarithm of the minimal angle of resolution (LogMAR) for calculations. If the BCVA did not improve by two lines or better within 2 weeks after wearing glasses full-time, a 6-hour occlusion over the sound eye combined with a full-time wearing of glasses was prescribed. Occlusion was instructed to be done outside of school hours and under parental observation. The patients were advised to do activities such as watching TV, reading and computer operating. The patients were observed at 6 month follow up and final BCVA was recorded. Compliance was determined by parental reports and those who had covered their eyes for over 3 hours a day were considered to comply well.

Visual improvement was determined by comparing post treatment BCVA (LogMAR) with pretreatment BCVA (LogMAR). Statistical analysis were performed using paired t-test.

### III. Results

There were 14 male and 11 females patients, and their age was range: 7~12 years (**Table 1**). The mean follow-up period after the initiation of treatment was 6 months. The classification types of anisometropia included myopia in 2 patients (8%), myopic astigmatism in 2 patients (8%), hyperopic astigmatism in 6 patients (24%), hyperopia in 15 subjects (60%) (**Table 2**). Hyperopia accounted for the highest proportion in 15 patients (60%). Mean pretreatment BCVA of amblyopic eyes was Log MAR 0.22 (**Table 3**). A 6-hour occlusion over the sound eye combined with a full-time wearing of glasses was prescribed and the patients were observed at 6 month follow up and final BCVA was recorded. Mean post treatment BCVA was Log MAR 0.0092 (**Table 3**). Classification of the post treatment BCVA showed Log MAR=0.0 in 3 cases (12%), Log MAR= 0.2 in 14 cases (56 %) and LogMAR=0.3 in 8 cases (32 %)(**Table 3**). **Table 4** shows comparison of pre treatment and post treatment BCVA, paired t-test was applied and significant results were obtained (p value < 0.00001).

### IV. Discussion

Occlusion of the non-amblyopic eye has been the major therapy of amblyopia. Though full-time occlusion has been classically used as an effective method, there is no proven advantage of longer daily occlusion hours. Opinions vary on the number of daily occlusion hours, and there have not been conclusions about the most effective and optimal regimen.

We aimed to reduce mental and social problems through part-time occlusion therapy taking place outside of school hours and targeting school children whose anisometropic amblyopia was detected for the first time at the age of 7 years and older. We also evaluated whether the treatment would be effective in this age group. In addition, we strongly instructed the parents to cover their children's sound eye outside of school hours and to observe their children during the occlusion time as much as possible. They were also advised to have their children do activities such as watching TV, reading or computer operating. Such detailed instructions gave the parents a realistic opportunity to adhere to the treatment, and its compliance was relatively good. Even though we could not compare our findings with an untreated group, we started occlusion therapy only in subjects in which the BCVA did not improve by two lines or better after 2 weeks of wearing glasses. The period of occlusion therapy was 6 months. Considering the types of anisometropia seen in our patients, the children who had only hyperopia and the ones who had hyperopic astigmatism accounted for 60 % and 24 %, respectively. This showed that the anisometropic amblyopia, which was hidden in the children over 7 years old, is mostly caused by hyperopia. In conclusion, the part-time occlusion therapy practiced out of school hours was effective in anisometropic amblyopes who were diagnosed at the age of 7 years and later and the patients complied well with the treatment. It is expected that the part-time occlusion therapy outside of school hours can be effectively used as a therapy in relatively older amblyopes.

### V. Conclusion

The most common component of anisometropia detected after 7 years of age was hyperopia. The part-time occlusion therapy, which had been carried out after school hours, was successful in most cases.

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