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Evaluation of the Effects of the Occlu-Pad for the Management of Anisometropic Amblyopia in Children

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ABSTRACT

Purpose: In recent years, amblyopia treatment device that can be used with both eyes open have been reported. The Occlu-pad is a device that can present images of tablet terminals to one eye only under binocular open conditions. Till date, no study has reported the effectiveness of Occlu-pad training for anisometropic amblyopia in a series of cases. In the present study, we evaluated the effectiveness of the Occlu-pad for the management of anisometropic amblyopia without the use of occlusion therapy (eyepatch).

Materials and Methods: We implemented Occlu-pad training for 22 children (mean age \pm standard deviation: 4.7 ± 1.2 years) with anisometropic amblyopia. The visual acuity before treatment initiation was 0.25 ± 0.08 . The difference in refraction between the healthy and amblyopic eyes was 3.10 ± 0.58 D.

Results: The visual acuity at 3 months and 6 months after training initiation was 0.06 ± 0.09 and -0.04 ± 0.07 , respectively; this indicates a significant improvement in vision. The compliance rates for Occlu-pad use during 0 – 3 months and 4 – 6 months after training initiation were $88.6\% \pm 18.9\%$ and $73.2\% \pm 18.9\%$; these rates decreased significantly with time.

Conclusions: Our findings suggest that the Occlu-pad is an effective tool for the management of anisometropic amblyopia in children.

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KEYWORDS

Amblyopia; Occlu-pad; visual acuity; treatment outcomes

Introduction

In conventional clinical ophthalmology, the treatment of amblyopia in children has mainly involved the use of spectacles for complete correction and occlusion therapy using an eyepatch.¹ Occlusion therapy, which requires the patient to wear an eyepatch, aims to improve visual acuity by enforcing the use of the amblyopic eye. It has been suggested that it is not always possible to achieve good visual acuity through spectacles, even in patients with mild anisometropic amblyopia.² Therefore, the use of occlusion therapy is considered important.

On the other hand, in recent years, amblyopia treatment devices that selectively show the visual target only to the amblyopic eye, with both eyes open, have been reported.³ The Occlu-pad was recently developed by remodeling the iPad, and it is expected to show great efficacy.³ This device enables visualization of the image of the tablet terminal only with the amblyopic eye under binocular open conditions and while wearing polarized glasses (Figure 1). Till date, there is only a single preliminary report involving patients who used the Occlu-pad in combination with occlusion therapy using an eyepatch; only two patients were treated using the Occlu-pad alone.³ Moreover, the progression of amblyopia treatment was followed for only a short period of time, i.e., 2 months. In addition, it is difficult to lend Occlu-pad to all patients with amblyopia as previously reported in a number of cases, because Occlu-pad is a special electronic

equipment. Therefore, in this study, the patient visited the hospital and conducted amblyopia treatment.

We examined amblyopia treatment by means of the Occlu-pad for 6 months, without using occlusion therapy (eyepatch), for treatment of anisometropic amblyopia.

Materials and methods

The subjects were 22 children (mean age \pm standard deviation: 4.7 ± 1.2 years) diagnosed with anisohypermetropic amblyopia (Table 1). All patients exhibited astigmatism of <1.50 D, and none exhibited strabismus, which was assessed using the prism cover test. No patient reported a history of previous amblyopia treatment. All patients were wearing complete correction glasses fitted under cycloplegic refraction achieved with cyclopentolate hydrochloride from the day of Occlu-pad training initiation. The mean visual acuity before the initiation of amblyopia treatment was 0.25 ± 0.08 (LogMAR), and the difference in refraction between the healthy and amblyopic eyes was 3.10 ± 0.58 D. The doctor instructed the patients to receive Occlu-pad training during hospital visits 2 days a week (30 min per session). The training required the patient to play any game requiring hand-eye coordination.

The corrected visual acuity at 3 and 6 months after treatment initiation and the compliance rate [training duration

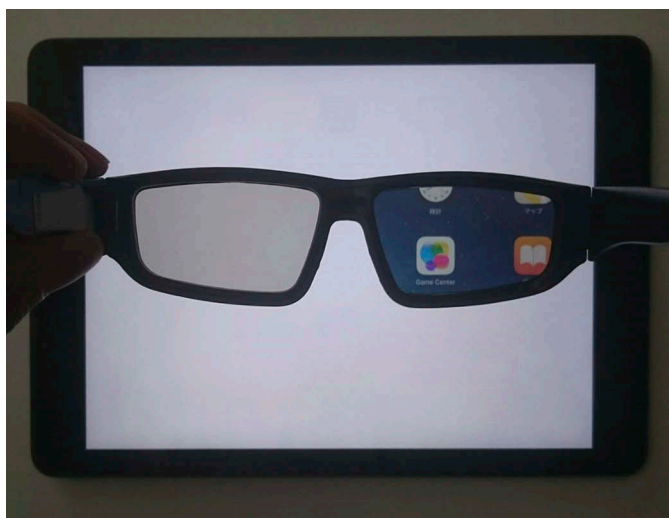


Figure 1. Appearance of the Occlu-pad used for the management of anisometric amblyopia in children.

The Occlu-pad enables visualization of the image of the tablet terminal only with the amblyopic eye under binocular open conditions and while wearing polarized glasses. In this figure, the right eye (amblyopic eye) can see the image of the tablet terminal, but the left eye (healthy eye) cannot.

Table 1. Characteristics of patients with anisometric amblyopia before and after 3 and 6 months of training using the Occlu-pad.

	Before	3 M	6 M
Visual acuity (LogMAR)	0.25 ± 0.08	0.06 ± 0.09	-0.04 ± 0.07
Age (years)	4.7 ± 1.2	-	-
Anisometric value (diopter)	3.10 ± 0.58	-	-

(actual number of visits to the hospital for training)/instructed training time (two 30-min sessions per week)] for Occlu-pad use were examined. During training, the orthoptist kept a check on whether the child was training appropriately. Visual acuity data before and after 3 and 6 months of training were statistically analyzed using the Bonferroni method. The paired *t* test was used to assess the compliance rate. A *p* value of <0.05 was considered statistically significant. The significance level according to the Bonferroni method was 0.05/3.

The study conformed to the tenets of the Declaration of Helsinki and was approved by the Kitasato University Human Sciences Ethics Committee (B-16-85). All procedures were carried out in accordance with approved guidelines. Potential subjects or parents gave written consent after receiving detailed information about the study, their role as a participant, and possible consequences.

Results

The mean visual acuity after training for 3 and 6 months was 0.06 ± 0.09 and -0.04 ± 0.07 , respectively (Figure 2), showing a significant improvement from the pretraining value (both $p < 0.0001$). In addition, the visual acuity at 6 months after treatment initiation was significantly better than that at 3 months ($p < 0.0001$). The compliance rates for Occlu-pad use during 0–3 months and 4–6 months after treatment initiation were $88.6\% \pm 18.9\%$ and $73.2\% \pm 18.9\%$, respectively (Figure 3). The

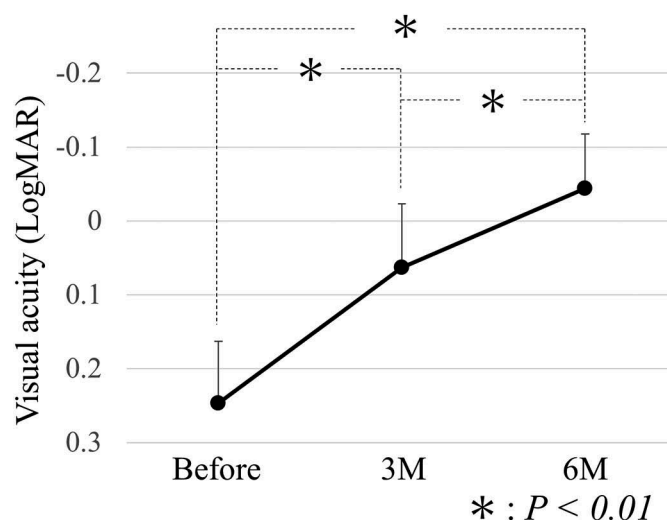


Figure 2. Visual acuity before and after 3 and 6 months of training using the Occlu-pad in children with anisometric amblyopia.

Values before and after training for 3 and 6 months are 0.25 ± 0.08 , 0.06 ± 0.09 , and -0.04 ± 0.07 , respectively.

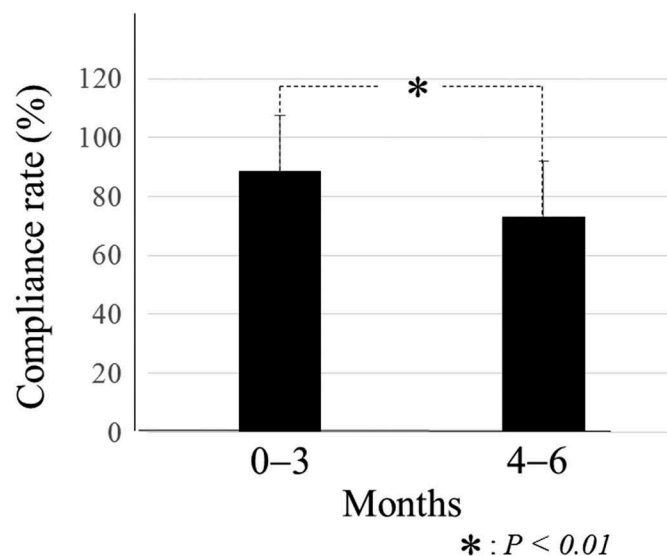


Figure 3. Rates of Occlu-pad use during 0–3 months and 4–6 months after training initiation in children with anisometric amblyopia.

The compliance rates are $88.6\% \pm 18.9\%$ and $73.2\% \pm 18.9\%$, respectively.

compliance rate at 6 months was significantly lower than that at 3 months ($p < 0.0001$).

Discussion

In this study, the management of mild anisometric amblyopia (average, 0.25 LogMAR) using the Occlu-pad in children was shown to be successful. The Occlu-pad is a special electronic device used for a relatively short training duration in a hospital setting; patients cannot train at home with this device. A correlation between the training time and an improvement in the visual acuity has been reported in one study,⁴ whereas other studies reported the absence of such a correlation.^{5,6} However, the results of our study suggested that even a short period of training (2 days per week, 30 min per

day) provided a sufficient treatment effect. The Occlu-pad can be used with both eyes open, unlike occlusion therapy with an eyepatch, which completely occludes one eye. Amblyopia and suppression are correlated; anisometropia turns into amblyopia because of suppression of the affected eye. Suppression is a concept established under binocular open conditions, not under one eye occlusion. Therefore, we believe that the binocular open condition is essential during Occlu-pad training to eliminate suppression. Although this is a speculation, it may be a factor for the favorable treatment effects after a short period of training.

Amblyopia treatment using an eyepatch at home has been documented to have a poor compliance rate.^{7,8} In the present study, children showed good compliance with Occlu-pad treatment. Occlusion therapy uses the eyepatch to enforce the use of the amblyopic eye; therefore, the child typically tries to remove the eyepatch. On the other hand, with the Occlu-pad, the patient cannot see the image on the tablet screen without wearing polarized glasses (without these glasses, only a white screen is seen). Therefore, patients are more motivated to wear the polarized glasses and participate in the training.

This study was limited by the fact that we could not compare the effects of Occlu-pad training with those of spectacles or occlusion therapy with an eyepatch. Further studies need to perform these comparisons.

In conclusion, our results suggest that Occlu-pad training is an effective and facile modality for the management of amblyopia, with good patient compliance.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References

1. Simons K. Amblyopia characterization, treatment, and prophylaxis. *Surv Ophthalmol.* 2005;50:123–26.
2. Cotter SA, Edwards AR, Wallace DK, Beck RW, Arnold RW, Astle WF, Barnhardt CN, Birch EE, Donahue SP, Everett DF, et al. Treatment of anisometropic amblyopia in children with refractive correction. *Ophthalmology.* 2006;113:895–903.
3. Handa T, Ishikawa H, Shoji N, Ikeda T, Totuka S, Goseki T, Shimizu K. Modified iPad for treatment of amblyopia: a preliminary study. *J Aapos.* 2015;19:552–54.
4. Stewart CE, Stephens DA, Fielder AR, Moseley MJ. MOTAS Cooperative. Modeling dose-response in amblyopia: toward a child-specific treatment plan. *Invest Ophthalmol Vis Sci.* 2007;48:2589–94.
5. Repka MX, Beck RW, Holmes JM, Birch EE, Chandler DL, Cotter SA, Hertle RW, Kraker RT, Moke PS, Quinn GE, et al. A randomized trial of patching regimens for treatment of moderate amblyopia in children. *Arch Ophthalmol.* 2003;121:603–11.
6. Yazdani N, Sadeghi R, Momeni-Moghaddam H, Zarifmahmoudi L, Ehsaei A, Barrett BT. Part-time versus full-time occlusion therapy for treatment of amblyopia: A meta-analysis. *J Curr Ophthalmol.* 2017;29:76–84.
7. Simonsz HJ, Polling JR, Voorn R, van Leeuwen J, Meester H, Romijn C, et al. Electronic monitoring of treatment compliance in patching for amblyopia. *Strabismus.* 1999;7:113–23.
8. Wallace MP, Stewart CE, Moseley MJ, Stephens DA, Fielder AR. Compliance with occlusion therapy for childhood. *Invest Ophthalmol Vis Sci.* 2013;54:6158–66.