International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 2, February 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.2.2025.25

ORIGINAL RESEARCH

Effectiveness of Part-time Occlusion Therapy in Children with Anisometropic Amblyopia

Dr. Hari Ramakrishnan[1], Dr. Anu B.S.[2]

[1]Associate Professor, [2]Senior Resident, Department of Ophthalmology, Dr. SMCSI Medical College and Hospital, Karakonam, Trivandrum, Kerala, India

Corresponding Author
Dr. Hari Ramakrishnan
Associate Professor, Department of Ophthalmology, Dr. SMCSI Medical College and Hospital, Karakonam, Trivandrum, Kerala, India

Received: 27 December, 2024 Accepted: 24 January, 2025 Published: 03 February, 2025

ABSTRACT

Purpose: To determine the proportion of children with improvement in best corrected visual acuity after part time occlusion therapy for anisometropic amblyopia.**Methods:** This was a prospective observational study on 33 children in the age group of 5 to 15 years with unilateral anisometropic amblyopia. Study period was from November 2018 to March 2020. Part time occlusion was advised when no improvement in visual acuity was noted after spectacle correction for 6 weeks. The duration of occlusion was 4 hours a day for 4 months. Follow up examination was conducted monthly for 4 months.**Results:** Out of the 33 subjects recruited, 16 children were in the age group of 5 to 8 years (48.5%), 11 children in the age group of 9 to 12 years (33.3%) and 6 were in the age group of 13 to 15 years (18.2%). Mean age was 9.2 +/- 2.8 years. 17 were males and 16 were females. Mean pretreatment best corrected visual acuity was 0.55+/-0.21 log MAR. After 4 months of occlusion therapy, the mean best corrected visual acuity was 0.3+/- 0.27 log MAR. 22 patients (66.7 %) had significant improvement in visual acuity. Children in the younger age group (5 to 12 years) showed maximum improvement.**Conclusion:** Significant improvement in best corrected visual acuity occurs after part time occlusion therapy for anisometropic amblyopia. Children who are younger respond better to this treatment.

Key Words: Amblyopia, Anisometropia, Occlusion Therapy.

INTRODUCTION

Amblyopia is a major cause of visual impairment in children and young adults. Anisometropic amblyopia is usually diagnosed later in life as children with good vision in one eye may not notice the blurred vision in the other eye.[1] Early detection and timely intervention are important in anisometropic amblyopia to prevent permanent visual impairment. While newer treatment modalities are emerging, occlusion therapy continues to be the mainstay of management in anisometropic amblyopia. The effective duration of daily occlusion in these cases is controversial.

While full time occlusion has been advocated in the past, newer studies support part time occlusion due to better acceptance and compliance. It has been reported that short period of patching is not inferior to full time patching.[2]

AIMS AND OBJECTIVES

This study was conducted

a) To determine the proportion of children with at least 2-line improvement in visual acuity after part time occlusion therapy for anisometropic amblyopia
b) To determine what type of refractive error (anisometropic myopia, hyperopia and astigmatism) responded better to treatment
c) To determine what age group showed better response to treatment
d) To assess the effectiveness of treatment in severe degree of amblyopia

MATERIALS AND METHODS

This was a Prospective Observational Study conducted at Dr Somervell Memorial CSI Medical College, Karakonam, Thiruvananthapuram from November 2018 to March 2020. Children in the age group of 5 to 15 years with unilateral anisometropic amblyopia visiting the Ophthalmology Out Patient Department were included in the study. 33 children were enrolled. Children with strabismus, bilateral amblyopia, severe amblyopia with best corrected

DOI: 10.69605/ijlbpr_14.2.2025.25

visual acuity less than counting fingers at 1m, previous ocular surgery and any ocular disease other than anisometropic amblyopia were excluded from the study.

Children in the age group of 5 to 15 years presenting to the OPD underwent complete ophthalmic evaluation including visual acuity recording using Snellen's Chart, retinoscopy, cover test, anterior segment evaluation on slit lamp, cycloplegic refraction and fundus examination using +90 D lens. Those who had a difference in spherical error of more than 1 D or more than 1.5 D difference in astigmatism between the eyes were considered Anisometropic. These children were prescribed spectacle correction. They were reevaluated after 6 weeks of refractive adaptation with spectacles. Those children who still had >/= 2-line difference in visual acuity between two eyes were diagnosed to have anisometropic amblyopia. 33 consecutive patients diagnosed with anisometropic amblyopia were included in the study.

All the enrolled children were advised unilateral patching of the sound eye after obtaining informed consent from the parent/ guardian. Duration of patching was 4 hours a day for a period of 4 consecutive months. Similar opaque patch was used in all patients (Surgiclude Orthoptic Eye Patch, Surgiwear Ltd.). Parents were counselled regarding the importance of patching.

Patching of the sound eye was done outside school hours under parental supervision and spectacles were worn over the patch. The children were encouraged to perform activities like watching TV, computer games etc when the patch was on.

The children were followed up at monthly intervals for follow up evaluation and to ensure compliance. Improvement in visual acuity was analyzed by comparing pre and post therapeutic visual acuity after transposing the Snellen acuity into log MAR equivalent. Significant visual improvement was defined as 2 or more Snellen line improvement in best corrected visual acuity after 4 months of occlusion therapy.

Statistical analysis was performed using SPSS version 20. Initial mean BCVA and final mean BCVA were assessed using mean and standard deviation. P value was calculated using paired sample t test and a value <0.05 was considered statistically significant. Association of improvement in visual acuity with age, type of anisometropia and grade of amblyopia were analyzed using chi square test and p value of less <0.05 was considered significant.

RESULTS

33 children in the age group of 5 to 15 years were included in the study. Mean age was 9.2 +/- 2.8 years. 16 children (48.5%) were in the age group of 5 to 8 years, 11 children (33.3%) were in the age group 5%) of 9 to 12 years and 6 children were in the age group of 13 to 15 years (18.2%). 17 children (51.5%) were males and 16 were females (48.5%).

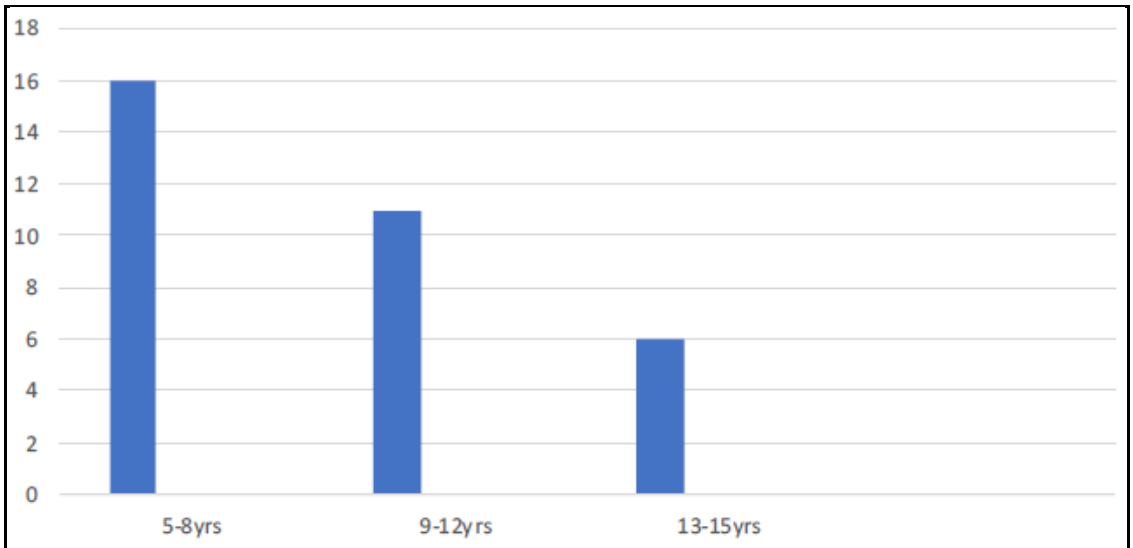

Figure 1. Bar diagram showing Age Distribution of the study population

21 children had anisoastigmatism (63.6%), 8 children (24.2%) had anisomyopia and 4 children had anisohyperopia (12.1%). 9 children (27.3%) had mild amblyopia (BCVA 6/9 to 6/12 in the amblyopic eye), 21 children (63.6%) had moderate amblyopia (BCVA 6/12 to 6/36 in the amblyopic eye) and 3 children (9.1%) had severe amblyopia (BCVA less than 6/36 in the amblyopic eye).

DOI: 10.69605/ijlbpr_14.2.2025.25

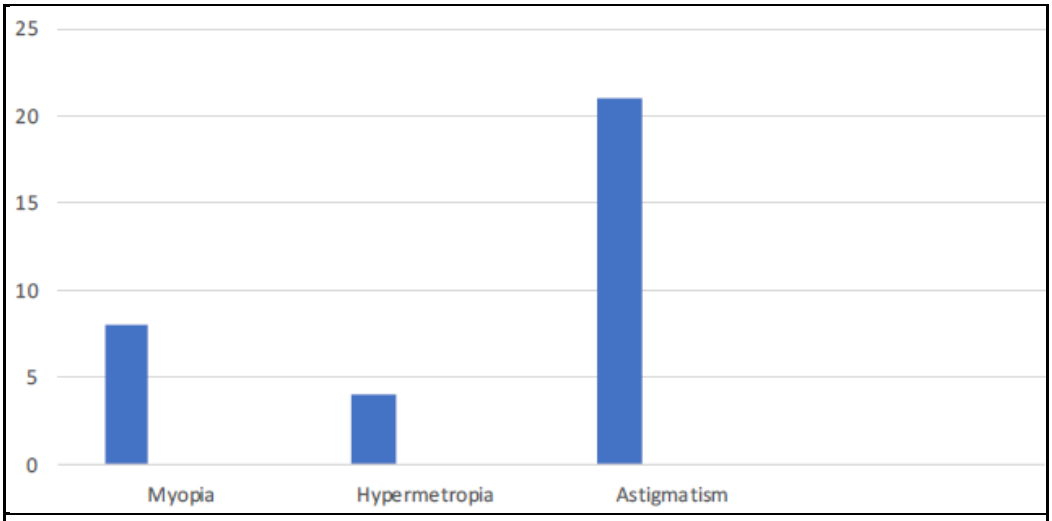

Figure 2: Bar diagram showing frequency distribution of type of anisometropia among the study population

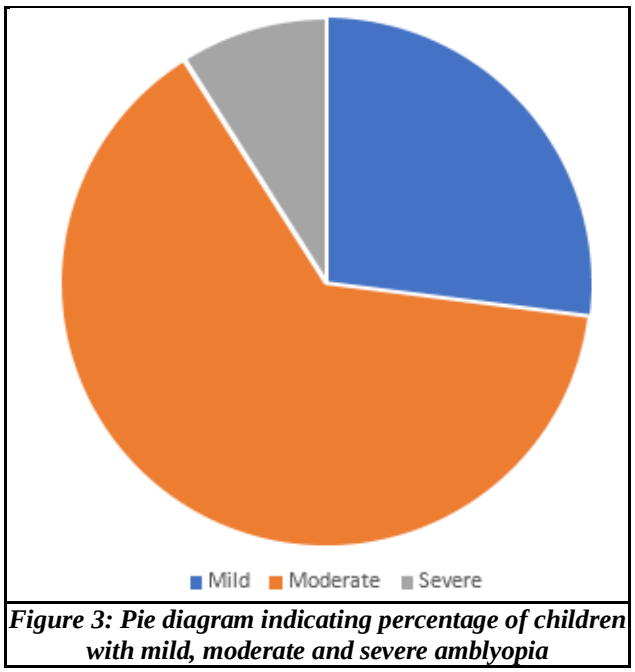

Figure 3: Pie diagram indicating percentage of children with mild, moderate and severe amblyopia

Mean BCVA before start of treatment was 0.55+/- 0.21 log MAR units. After 1 month of therapy, mean BCVA was 0.52 +/- 0.22 log MAR units. Mean BCVA was 0.43 +/- 0.18 log MAR units after 2 months and 0.36 +/- 0.23 log MAR units after 3 months of therapy. At the end of 4 months of treatment, mean BCVA improved to 0.3 +/- 0.27 log MAR. Improvement in visual acuity was analyzed with paired t test and was statistically significant (p=0.001). Out of the 33 children, 22 (66.7%) had significant improvement in BCVA after 4 months of therapy. Maximum improvement in BCVA was noticed during the 3rd month of starting occlusion (39.4%) and 33.3% had maximum improvement during the 4th month of treatment.

Line of improvement in BCVA after 4 months	Frequency	Percentage
No improvement	5	15.2%
1 line improvement	6	18.2%
2-line improvement	16	48.5%
3-line improvement	6	18.2%
Total	33	100%

Table 1: Frequency distribution of line of improvement in BCVA among study population

DOI: 10.69605/ijlbpr_14.2.2025.25

Out of the 16 children in the age group of 5 to 8 years, 15 (93.8%) had improvement of >/= 2 lines in visual acuity. 1 child had a single line improvement. Among the 11 children in the age group of 9 to 12 years, 7 had ≥ 2-line improvement (63.6%), 3 had single line improvement (27.3%) and one child had no improvement at all. 6 children were in the age group of 13 to 15 years out of which only 2 children had single line improvement. Significant improvement was not seen in any of these children. The association between age and initiation of therapy was analyzed by chi square test and was statistically significant. Thus, majority of children with improvement in visual acuity belonged to the younger age group.

Age Distribution	Line of improvement in BCVA after 4 months			Chi Square value	P value
	No improvement	1 line improvement	>2- line improvement		
5-8	0 (0.0%)	1 (16.7%)	15 (68.2%)	21.486	0.001*
9-12	1 (20.0%)	3 (50.0%)	7 (31.8%)		
13-15	4 (80.0%)	2 (33.3%)	0 (0.0%)		
Total	5 (100%)	6 (100%)	22 (100)		

Table 2: Comparison of line of improvement in BCVA after 4 months of therapy with age group

Out of 8 children with Anisomyopia, 5 children had significant improvement with treatment (62.5%), one child had single line improvement (12.5 %) and 2 children had no improvement (25%). In 21 children with anisoastigmatism, 14 showed significant improvement (66.7%), 5 had single line improvement (23.8%) and 2 children had no improvement (9.5%). Among children with anisohyperopia (4 children), 3 (75%) showed significant improvement and 1 had no improvement (25 %). The results were analyzed using chi square test and was not significant. Thus, there was no correlation between improvement in visual acuity and type of anisometropia.

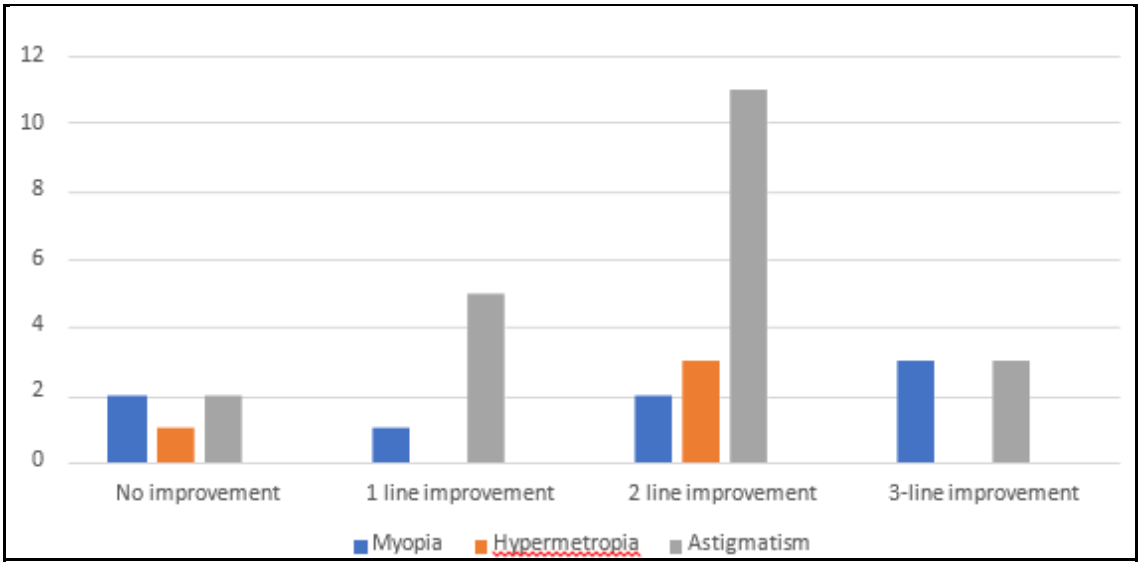

Figure 4. Comparison of type of Anisometropia with improvement in visual acuity after 4 months of therapy

Out of 9 children with mild amblyopia (BCVA 6/9 - 6/12), 8 had significant (>2 line) improvement in visual acuity (88.9%) and one had single line improvement (11%). Among the 21 children with moderate amblyopia (BCVA 6/12 – 6/36), 13 had significant improvement (62%), 3 children had single line improvement (14.3%) and 5 had no improvement (23.8%). Out of 3 children with severe amblyopia (BCVA<6/36), one child had significant improvement (33.3%) and 2 children showed single line improvement (66.6%). Among the 22 children with significant improvement in visual acuity, 13 had moderate amblyopia (59%), 8 had mild amblyopia (36.4%) and one child had severe amblyopia (4.5%). Out of 6 children with single line improvement, 3 (50%) had moderate amblyopia, 2 children (33.3%) had severe amblyopia and one child had mild amblyopia (16.7%). 5 children with no improvement after treatment after 4 months had moderate amblyopia. There was no statistically significant association between visual improvement and grade of amblyopia.

DOI: 10.69605/ijlbpr_14.2.2025.25

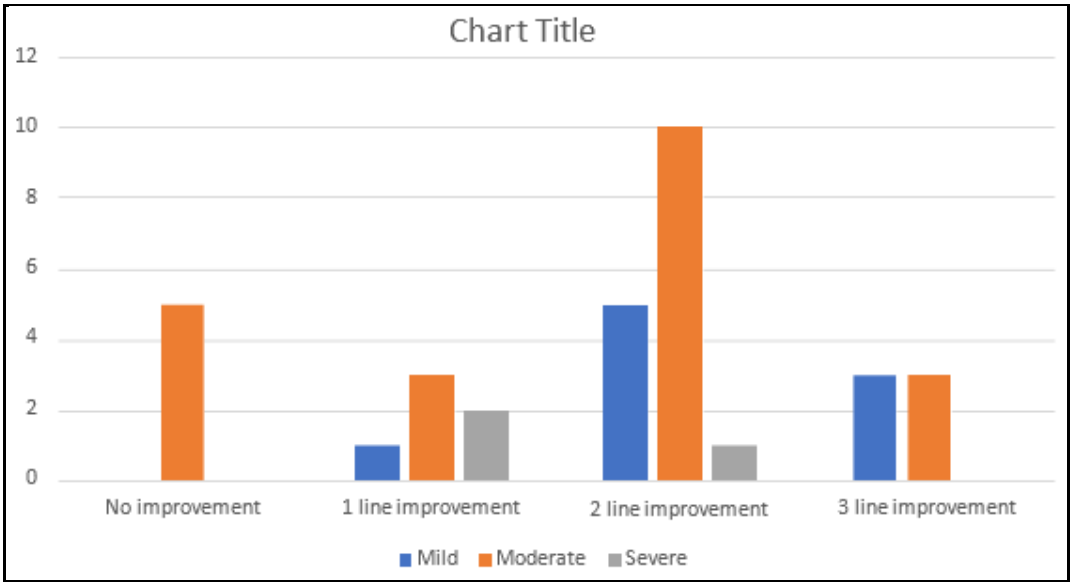

Figure 5.

DISCUSSION

In this study, 33 children aged 5 to 15 years with anisometropic amblyopia underwent part time occlusion therapy of 4 hours daily for 4 consecutive months. Prior to starting occlusion, all the children were given a period of 6 weeks for adaptation with appropriate spectacles. Stewart et al have proposed that visual improvement can occur during this period of refractive adaptation and that it helps to improve compliance to occlusion therapy and even avoid occlusion in some patients.

Improvement in visual acuity after part time occlusion therapy in anisometropic amblyopia have been demonstrated in studies by Kavitha et al. In this study, 30 children with anisometropic amblyopia having a mean baseline visual acuity of 0.67+/- 0.22 log MAR units underwent part time occlusion therapy (6 hours a day) for 18 weeks. The mean post treatment visual acuity was 0.53+/-0.25 log MAR units and the improvement was statistically significant.[3] In another study by Baskaran et al mean BCVA of children with anisometropic amblyopia improved from 0.75+/- 0.1 log MAR units to 0.24+/-0.08 log MAR units after part time occlusion therapy.[4] In our study, out of 33 children, 22 (66.7%) had significant improvement in visual acuity after 4 months of occlusion therapy. 6 children had single line improvement and 5 (15.2%) had no improvement. Pang et al reported improvement in visual acuity in 15 out of 17 patients who underwent part time occlusion therapy for anisometropic amblyopia. However, the duration of occlusion was 6 hours for severe amblyopia in these patients.[5] Thus, longer duration of occlusion and longer period of treatment can probably give better results. In our study, the duration of occlusion was 4 hours a day and the final follow up was at 4 months. Maximum improvement in visual acuity has been reported to occur at 3 months after starting treatment in studies conducted by Lithander et al and Hwang et al.[6,7]

In our study, significant improvement in visual acuity occurred in 93.8% of children in the younger age group (5 to 8 years). In children aged 9 to 12 years it was 63.6 %. None of the children in the older age group showed significant improvement. However, improvement in visual acuity in older children have been reported in studies conducted by Patwardhan et al.[8] Sen et al and PEDIG reported the improvement in visual acuity in older children (13 to 20 years).[9,10] These findings are different from our present study and can be attributed to the relatively low sample size for the older age group in our study. Despite all this evidence, upper age limit for occlusion therapy is still controversial.

In our study, 21 children had anisoastigmatism, 8 had anisomyopia and 4 had anisohyperopia. Significant improvement in visual acuity following treatment was 75% in anisohyperopia, 62.5% in anisomyopia and 66.7% in anisoastigmatism. There was no statistically significant difference between the three groups. This was similar to the results reported by Chen et al who concluded that there was no significant difference in outcome based on the type of refractive error in anisometropia after occlusion therapy.[11]

There was no statistically significant association between severity of amblyopia and response to treatment in our study. This has also been reported by Kavitha et al and Park et al in their studies.[3,12]

CONCLUSION

There is significant improvement in best corrected visual acuity following part time occlusion in children with anisometropic amblyopia. Younger children tend to respond better to treatment. There was no association between type of anisometropia (myopia, hyperopia or astigmatism) and visual improvement. Severity of amblyopia did not show any association with the improvement in best corrected visual acuity.

DOI: 10.69605/ijlbpr_14.2.2025.25

Part time occlusion therapy is strongly recommended in children with anisometropic amblyopia. Initiating therapy at a younger age shows more favorable response to treatment. Regular follow up and intensive monitoring of compliance is very important to achieve best results.

REFERENCES

1. Von Noorden GK. Classification of amblyopia. Am J Ophthalmol 1967;63:238-44.
2. Arikan G, Yaman A, Berk AT. Efficacy of occlusion treatment in amblyopia and clinical risk factors affecting the results of treatment. Strabismus 2005;13(2):63-9.
3. Kavitha V, Chaitra S, Heralgi MM. Occlusion therapy in older children with amblyopia. J Clin Ophthalmol Res 2016;4:71-4.
4. Baskaran K, Swaminathan M. The results of treatment of anisomyopic and anisohyperopic amblyopia. Int Ophthalmol 2009;29:231-7.
5. Pang Y, Allison C, Frantz KA, Block S, Goodfellow GW. A Prospective pilot study of treatment outcomes for amblyopia associated with myopic anisometropia. Arch Ophthalmol 2012;130 (5):579-84.
6. Lithander J, Sjostrand J. Anisometropic and strabismic amblyopia in the age group 2 years and above: a prospective study of the results of treatment. Br J Ophthalmol 1991;75:111-6.
7. Hwang JM, Park KH and Ahn JK. Efficacy of amblyopia therapy initiated after 9 years of age. Eye 2004;18:571-4.
8. Patwardhan NA. Is age relevant for the success of treatment of anisometropic amblyopia? Ind J Ophthalmol 2007;55:469-70.
9. Sen DK. Results of treatment of anisometropic amblyopia without strabismus. Br J Ophthalmol 1982;66:680-4.
10. Pediatric Eye Disease Investigator Group (PEDIG). A prospective pilot study of treatment of amblyopia in children 10 to < 18 years old. Am J Ophthalmol 2004;137:581-3.
11. Chen PL, Chen JT, Tai MC, Fu JJ, Chang CC, Lu DW. Anisometropic amblyopia treated with only glasses correction: possible factors predicting success and time to start patching. Am J Ophthalmol 2007;143(1):54-60.
12. Park KS, Chang YH, Na KD, Hong S, Han SH. Outcomes of 6-hour part time occlusion treatment combined with near activities for Unilateral Amblyopia. Korean J Ophthalmol 2008;22(1):26-31.