Proportion of Non-Compliance and Factors Affecting It in Children Undergoing Occlusion Therapy for Amblyopia

Pravitha M. Kumar1, Naina Jabeen Hyder2, Shaji A.3, Sunil M.S.4, Pappa P.5

1, 2, 4 Department of Ophthalmology, Regional Institute of Ophthalmology, Thiruvananthapuram, Kerala, India. 3 Department of Ophthalmology, Kottayam Medical College, Kerala, India. 5 Department of Ophthalmology, Government Medical College, Thrissur, Kerala, India.

ABSTRACT

BACKGROUND
The term amblyopia literally means dullness of vision. It is defined as unilateral or bilateral reduction of visual acuity due to pattern vision deprivation or abnormal binocular interaction for which no ocular causes can be detected by ocular examination and can be reversed by therapeutic measures. The study was undertaken to estimate the proportion of non-compliance and factors affecting it in children undergoing occlusion therapy for amblyopia.

METHODS
The study was designed as a hospital based cross sectional study. Children aged 5 - 12 years undergoing occlusion therapy for amblyopia due to strabismus, anisometropia or both, who had been prescribed occlusion for a period of minimum 3 months were included in the study. Children with developmental or neurological disorders and other ocular conditions causing visual impairment, whose parents were not willing to participate in the study or follow up, and uncooperative children were also excluded from the study.

RESULTS
52.5 % were non-compliant to occlusion therapy, 31.1 % were partially compliant and only 16.4 % were compliant. 38.5 % had final visual acuity in the range of 6 / 60 - 6 / 24 and 6 / 18 – 6 / 12, 20 % had 6 / 9 - 6 / 6. Different variables were assessed against compliance to check for any association. Significant association was found between compliance to occlusion and socioeconomic status (p = .006), visual acuity at presentation (p = .026), type of amblyopia (p = .038) and final visual acuity (p < .01) and association with educational status were found to be borderline (p = .059).

CONCLUSIONS
Occlusion therapy for amblyopia is a long drawn process which needs strict compliance and regular follow up. Compliance is a major factor affecting final visual outcome. Poor compliance leads to unsuccessful amblyopia therapy which in turn can have negative impact on child’s learning ability and psychosocial wellbeing. For this reason it is critical that care givers leave the clinic with clear knowledge of how and why patching is being recommended and its importance in improving child’s vision.

KEYWORDS
Amblyopia, Occlusion, Compliance
BACKGROUND

The term amblyopia literally means dullness of vision. It is defined as unilateral or bilateral reduction of visual acuity caused by pattern vision deprivation or abnormal binocular interaction for which no ocular causes can be detected by ocular examination and can be reversible by timely intervention and by introducing appropriate therapeutic measures. It is a reduction in visual acuity associated with one or more known amblyogenic factors such as strabismus, anisometropia, high refractive error and cataract. Amblyogenic factors interfere with development and maturation of the visual pathway. Amblyopia results in structural and functional impairment of the visual cortex. Amblyopia is a neurodevelopmental disorder of the visual cortex that arises from abnormal visual experience early years of life.1

Amblyopia usually start within the first 3 years of life and is thought to reflect alterations in the properties of neurons in visual cortical areas (V1 and V2) and also in the visual pathway possibly even in the LGN2 (Lateral Geniculate Nucleus).2,3 Amblyopes suffer from sensory deficits due to these alterations. They suffer from deficits not simply explained by low-level considerations.4,5,6 Thus, amblyopia leads to deficit in basic visual perception and is also important to many other aspects of visual cognition. Brain plasticity is known to peak during the critical period in early childhood upto 8 - 9 years and to decrease thereafter.7-10 Prevalence of amblyopia worldwide is approximately 1 - 5 %. WHO (World Health Organization) estimates 19 million children less than 15 years of age are visually impaired, of those 12 million are impaired due to uncorrected refractive errors and amblyopia.11-14

METHODS

The study was designed as hospital based cross sectional study. Inclusion criteria was children aged 5 - 12 years undergoing occlusion therapy for amblyopia due to strabismus, anisometropia or both, who have been prescribed occlusion for a period of minimum 3 months. Exclusion criteria included children with developmental or neurological disorders like cerebral palsy, seizure dis orders, global development delay with ocular problems contributing to visual impairment. Those who were not willing for the study or follow up and uncooperative children were also excluded from the study. All consecutive children undergoing occlusion therapy for amblyopia taking into consideration of the inclusion and exclusion criteria were included in the study. After obtaining a written informed consent from the parents, children underwent detailed clinical examination which included visual acuity (using Snellen’s visual acuity chart) complete ocular examination including slit lamp biomicroscopic examination, extraocular movements, strabismus evaluation by cover uncover test, amount of strabismus measured using Hirschberg test / Krimsky test / prism bar cover test, fundus examination using direct and indirect ophthalmoscopy to assess retinal and optic disc changes, refraction with cycloplegics, type and degree of amblyopia assessment, spectacle correction if needed, recommended hours of patching per day. Parents were given a diary charting the dates for 3 calendar months (till their next review). Parents were asked to write the number of hours of patching each day in the calendar and assessed during follow up visit. Compliance was graded according to the self-reported calendar charting of patching hours. Children patching more than 75 % of recommended hours are considered as compliant, 50 - 75 % as partially compliant and less than 50 % as non-compliant. At follow up visit after 3 months parents were given a questionnaire based on amblyopia treatment index patching questionnaire. Visual acuity assessed in follow up visit at 3 months and 6 months and non-compliance was also assessed. Sample size was calculated based on the formula = 4 pq / d2 Where 4 = constant, p = prevalence, q = 1-p, d = 20 % of p 4 * 55 * 45 / 81 = 122. Sample size required for the present study was calculated as 122. The study period was 3 months (January 2018 to January 2019). Institutional Ethical Committee clearance was obtained and written informed consent obtained from parents. Confidentiality ensured and maintained throughout the study. No expenses were incurred from the participants of the study. Data was entered in excel sheet. Categorial and quantitative variables were expressed as frequency (percentage). Independent t test was used to compare quantitative parameters between categories. Chi square test was used to test association between categorial variables. For all statistical interpretations, p < .05 was considered the threshold for statistical significance. Statistical analysis was done by using a statistical software package SPSS, version 20.0.

RESULTS

In this study 122 children aged 5 - 12 years undergoing occlusion therapy for amblyopia were included out of which 55.7 % were boys and 44.3 % were girls. 83.6 % of children had mother as their caretaker and only 8.2 % had father as caretaker. 59.8 % of parents were educated above SSLC (Secondary Level School Certificate) and 40.2 % were below SSLC. Majority belonged to middle class family-lower middle class 53.3 %, upper middle class 29.5 %, upper lower class 11.5 %, 4.1 % were upper class and 1.6 % lower class. 45.1 % had at presentation visual acuity in the range of 6 / 60 – 6 / 24, 41.8 % had less than 6 / 60 and 13.1 % between 6 / 18 - 6 / 12. 53.3 % had anisometropic amblyopia, strabismic 33.8 %, combined 23 % as shown in Table 1. 150 % had moderate degree of amblyopia, 28.7 % had mild and 21.3 % had severe amblyopia as shown in Table 2.

| Types of Amblyopia | Percentage |
|--------------------|------------|
| Anisometropic      | 53.3       |
| Strabismic         | 23.8       |
| Combined           | 22.9       |

Table 1. Types of Amblyopia

79.5 % were compliant to spectacles, and 20.5 % noncompliant. 68 % were using occludie as the occluder
and 32% were using doyens. 57.4% of children started on occlusion therapy were in the age group between 5-7 years and 42.6% between 8-12 years as shown in Table 3. 35.2% had treatment duration in the range of 2-5 years, 17.2% had in between 3-6 months and 7 months to one year, 16.4% had more than 5 years and 13.9% had less than 3 months. 52.5% were non-compliant to occlusion therapy, 31.1% partially compliant and only 16.4% were compliant as shown in Table 3. 38.5% had final visual acuity in the range of 6/60-6/24 and 6/6-18/6/12, 20.5% had 6/9-6/6 and 2.5% had final visual acuity less than 6/60 as shown in Table 3.

### Table 2. Grades of Amblyopia

| Grades of Amblyopia | Percentage |
|---------------------|------------|
| Mild                | 50.0       |
| Moderate            | 28.7       |
| Severe              | 21.3       |

### Table 3. Variables Measured

| Variable                      | Percentage |
|-------------------------------|------------|
| Age of Onset of Occlusion     |            |
| 5-7 yrs.                      | 57.4       |
| 8-12 yrs.                     | 42.6       |
| Less than 3 Months            | 13.9       |
| Treatment Duration            |            |
| 3-6 Months                    | 17.2       |
| 7 months-1 yr.                | 17.2       |
| 2-5 yrs.                      | 35.2       |
| More than 5 yrs.              | 16.4       |
| Compliance to Occlusion Therapy |            |
| Partially Compliant           | 31.1       |
| Non-Compliant                 | 52.5       |
| Less than 6/60                | 2.5        |
| 6/60-6/24                    | 38.5       |
| 6/18-6/12                    | 38.5       |
| 6/9-6/6                      | 20.5       |

DISCUSSION

Amblyopia accounts for one of the commonest cause visual impairment among children and young adults. Occlusion therapy is the first line of treatment of amblyopia. Many studies have shown that compliance to occlusion therapy is a significant factor in the outcome of success for treatment of amblyopia. In this study total of 122 children (aged 5-12 years) undergoing occlusion therapy for amblyopia (strabismic, anisometropic, combined) satisfying inclusion and exclusion criteria were included. Among them boys were slightly more in number (55.7%) than girls (44.3%) similar to a study on 'Prevalence and aetiology of amblyopia in southern India'. In their study prevalence of amblyopia was 1.1%. The number of boys with amblyopia (n = 25, 57%) was slightly higher than girls (n = 19, 43%); p = .06).

83.6% of children had mother as their caretaker and only 8.2% were father and others and no significant association was found between caretaker status and compliance. Similarly in a study on 'Childhood amblyopia treatment: psychosocial implications for patients and primary carers', majority of the carers (n = 52) were mothers of the child seen in the clinic. 59.8% of parents
were educated above SSLC and 40.2 % were below SSLC and among non-compliance 65.3 % of caretaker were below SSLC (borderline $p = .059$).$^{15-20}$

The factors studied for non-compliance are shown in the Table 4.

**Table 4. Factors for Non-Compliance**

| Socioeconomic Status | Upper Lower and Lower Class ($p = .006$) |
|----------------------|-----------------------------------------|
| Final Visual Acuity  | Less than 6 / 60 and 6 / 60 - 6 / 24 ($p = 0.01$) |
| Initial Visual Acuity| Less than 6 / 60 ($p = 0.26$) |
| Type of Amblyopia    | Strabismic Amblyopia ($p = 0.38$) |
| Educational status of Caretaker | Below SSLC ($p = 0.55$) |

Increased awareness in children about the compliance to occlusion therapy yielded good results. The influence of parental education on the status of therapeutic success of amblyopia showed no significant difference. The therapeutic success in amblyopia treatment largely depends on the compliance to occlusion therapy, which forms the single most significant factor for amblyopia management. It signifies the importance for the treating ophthalmologist to discuss with the parents of these children about the treatment modality in order to get their trust and support for compliance to occlusion therapy. $45.1$ % had at presentation visual acuity in the range of $6 / 60 - 6 / 24$ and found to have strong association with compliance ($p = .026$). Several studies have shown that the initial best corrected visual acuity prior to occlusion therapy is an important prognostic factor in the outcome of success of amblyopia treatment. In a study on ‘Predictors and a Remedy for Noncompliance with Amblyopla Therapy in Children Measured with the Occlusion Dose Monitor’ showed that initial poor visual acuity at the start of treatment was the only significant clinical factor ($p = 0.033$). Mean compliance in the study showed that $58$ % compliance in children with initial lowest corrected visual acuity in comparison to $79$ % compliance in children with the highest best corrected visual acuity.$^{21-25}$ This finding is in agreement with other studies and it has found that the child’s acceptance for the patch is less when acuity is low. $68$ % were using opticlue as the occluder and $32$ % were using doyens in this study. Studies have shown that compliance to the patch was not related to the brand or by the usage of different colours or various designs of patches. Parental satisfaction was moderate. In this study the prevalence of non-compliance to occlusion therapy was found to be $52.5$ %, $31.1$ % were partially compliant and only $16.4$ % were compliant. In a study on ‘Psychosocial and clinical determinants of compliance with occlusion therapy for amblyopia’, self-reported analysis of compliance with eye patching revealed that only $54$ % of parents were achieving the results to therapy as per orthoptist’s advice to patch their child. Compliance to occlusion therapy can be electronically measured using an of an Occlusion Dose Monitor (ODM). Studies showing that the compliance determined was in the range of $48 - 58$ % using ODM.$^{26-28}$ Studies show that noncompliance with occlusion therapy is widely common, substantial and a major factor leading to treatment failure. A study on ‘The influence of parental attitudes and behaviour on compliance with amblyopia therapy and the effect of an educational programme’ showed distress in family both parents and children as the main cause of poor compliance ($p < 0.001$), secondly by increased vulnerability ($p = 0.014$), increased stigma ($p = 0.017$) and poor logistics of treatment ($p = 0.044$). Lack of knowledge about the causes of amblyopia and its management, distress in family due to patching regime and logistical problems to be the primary reasons for non-compliance. The education of parents about the treatment modality positively influenced the level of distress ($p = 0.038$). In our study improvement in visual acuity among all the variables assessed had a significant influence on compliance and the factors like the age at onset of therapy, gender, degree of amblyopia, compliance with glasses, did not show significance in compliance to patching. Significant association was found between compliance to occlusion and socioeconomic status ($p = .006$), visual acuity at presentation ($p = .026$), type of amblyopia ($p = .038$) and final visual acuity ($p < .01$) and association with educational status were found to be borderline ($p = .059$). Among non-complaints, $81.3$ % belongs to lower class family ($p = .006$), $65.3$ % of caretaker were below SSLC ($p = .059$), $62.1$ % were having strabismic amblyopia ($p = .038$) and had poor final visual acuity ($p < .01$). $66.7$ % had $< 6 / 60$ vision and $68.1$ % had $6 / 60 - 6 / 24$. Also in their study the major group of patients were with strabismic amblyopia (48 %) as compared to anisometropic (12 %) and mild amblyopia was more prevalent (45 %) compared to moderate (26 %) or severe (33 %) ones in contradiction to my study where anisometropic (53.3 %) and moderate degree amblyopia (53.3 %) dominates.

In a study on ‘Prevalence and aetiology of amblyopia in Southern India’ a total of $28 (63.7 %)$ children had mild to moderate amblyopia, whereas $16 (36.3 %)$ had severe amblyopia.$^{26-30}$ As per Hills et al the major cause of amblyopia in order of occurrence is strabismus (about 50 %), usually esotropia in infancy or early childhood,$^{12}$ the second cause is anisometropia (approx. 17 %), thirdly by a combination of strabismus and anisometropia (about 30 %), and finally the last cause in the order of prevalence is visual deprivation (≤ 3 %) which results in severe and irreversible amblyopia. In a study on ‘Factors Affecting Treatment Compliance in Amblyopia’ shown that children with anisometropic amblyopia were more compliant than those with strabismus similar to my study. From questionnaire, majority of parents (93 %) strongly agree that patching improves child’s vision but they worry that patching affects child’s learning (78 %) and make child feel different from other children (75 %). Only a few of them (20 %) complaints of redness and irritation of skin while wearing patch. Some complaints that other children stare at them while the patch is on (58 %). But in study on ‘Compliance of amblyopic patients with occlusion therapy: a pilot study’ observed that one-third parents were not satisfied with information given. Even though 90 % were sure of the credibility of the treatment, whereas 50 % were confused by the information given in the clinic and had poor understanding about the disease. In a study on ‘The emotional impact of amblyopia treatment in preschool children: randomized controlled trial’ which revealed that parents reported they had difficulty in patching their child irrespective of age (77 % at age 4 years and 73 % at age 5 years), but the difficulty was less when glasses were given alone (42 % and 53 %, respectively).
Children were more upset by occlusion and was less upset when glasses were only worn. Many children will oppose wearing a patch initially. Better outcome of patching occurs by encouragement from family members, teachers, and others. Children who oppose patching initially will eventually learn to keep it on the eye. This can be achieved by engaging them in an enjoyable and distracting activity immediately after placing the patch. It is important that parents understand the need of the patch and that they must be persistent and inculcate in the child the habit of wearing of the patch and in the process making the child understand that patching is expected of them and non-negotiable. It is useful to create a patching calendar. If the child sticks on to the patching calendar rewards points can be given to the child at the end of the week. School is an excellent place to patch if the patient, teacher, and classmates are instructed properly. If done so, with the cooperation and understanding of the child with the help by teachers and other children, school patching need not be a socially stigmatizing experience. On the other hand, frequently a parent or other family member may entrusted with the task of monitoring patching at home than which is possible in schools. Vigilance from the parental side with the help of teachers can impart better understanding in the child about the need for patching. Parents should discuss with the child and should be flexible in the schedule of patching. Children are good imitators. Some children may like to have their favourite toy or doll wearing a patch. So children can be encouraged to imitate their favourite toys. They can even decorate their own patch with stickers before putting it on. Buying coloured patches and patches with cartoon pictures will be more attractive for children. In children who resist patching arm guards can be used as gentle restraints, which will prevent them from removing patch. When arm guards are worn, their hands are restrained which will keep most children from removing the patch by preventing them from bending their elbows. After constant usage of arm guards for the prescribed time, children learn that if they leave the patch on they will not have to wear the arm guards. For older children are made to understand that enjoyable activities are permitted when the patch is on like playing their favourite board game or a video game. This is particularly useful in patients participating in part-time occlusion.

**CONCLUSIONS**

Occlusion therapy for amblyopia is a long drawn process which needs strict compliance and regular follow up. Compliance is a major factor affecting final visual outcome. Poor compliance is the major factor for failure of amblyopia therapy, which in turn can have negative impact on child's learning ability and psychosocial wellbeing. For this reason it is critical that caregivers leave the clinic with clear knowledge of how and why patching is being recommended and its importance in child's vision. Socioeconomic status and educational status of caretaker is found to play a major role in amblyopia therapy. Parents should be educated on the importance of critical period, occlusion therapy and impact of not treating amblyopia in the visual development of the child. So the clinician should work in tandem with the parents and the caregivers so that an increased understanding of amblyopia and visual development is given to them. This will ultimately improve compliance to patching and so a final better visual outcome is achieved.

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**REFERENCES**

[1] Fu J, Li SM, Liu LR, et al. Prevalence of amblyopia and strabismus in a population of 7th-grade junior high school students in Central China: The Anyang Childhood Eye Study (ACES). Ophthalmic Epidemiol 2014;21(3):197-203.

[2] Ganekal S, Jhanji V, Liang Y, et al. Prevalence and etiology of amblyopia in Southern India: results from screening of school children aged 5-15 years. Ophthalmic Epidemiol 2013;20(4):228-231.

[3] Oscar A, Cherninkova S, Haykin V, et al. Amblyopia screening in Bulgaria. J Pediatr Ophthalmol Strabismus 2014;51(5):284-288.

[4] Hess RF, Mansouri B, Thompson B. Restoration of binocular vision in amblyopia. Strabismus 2011;19(3):110-118.

[5] Loudon SE, Polling JR, Simonsz HJ. A preliminary report about the relation between acuity increase and compliance in patching therapy for amblyopia. Strabismus 2002;10(2):79-82.

[6] Hussein MAW, Coats DK, Muthialu A, et al. Risk factors for treatment failure of anisometropic amblyopia. J AAPOS 2004;8(5):429-434.

[7] Loudon SE, Fronius M, Looman CWN, et al. Predictors and a remedy for noncompliance with amblyopia therapy in children measured with the occlusion dose monitor. Invest Ophthalmol Vis Sci 2006;47(10):4393-4400.

[8] Searle A, Norman P, Harrad R, et al. Psychosocial and clinical determinants of compliance with occlusion therapy for amblyopic children. Eye (Lond) 2002;16(2):150-155.

[9] Smith LK, Thompson JR, Woodruff G, et al. Factors affecting treatment compliance in amblyopia. J Pediatr Ophthalmol Strabismus 1995;32(2):98-101.

[10] Menon V, Chaudhuri Z, Saxena R, et al. Factors influencing visual rehabilitation after occlusion therapy in unilateral amblyopia in children. Indian J Med Res 2005;122(6):497-505.

[11] Keech RV, Kutschke PJ. Upper age limit for the development of amblyopia. J Pediatr Ophthalmol Strabismus 1995;32(2):89-93.
[12] Hillis A, Flynn JT, Hawkins BS. The evolving concept of amblyopia: a challenge to epidemiologists. Am J Epidemiol 1983;118(2):192-205.

[13] Pai AS, Rose KA, Leone JF, et al. Amblyopia prevalence and risk factors in Australian preschool children. Ophthalmology 2012;119(1):138-144.

[14] Chia A, Lin X, Dirani M, et al. Risk factors for strabismus and amblyopia in young Singapore Chinese children. Ophthalmic Epidemiol 2013;20(3):138-149.

[15] Xiao O, Morgan Ig, Ellwein LB, et al. Prevalence of amblyopia in school-aged children and variations by age, gender and ethnicity in a multi-country refractive error study. Ophthalmology 2015;122(9):1924-1931.

[16] Friedman DS, Repka MX, Katz J, et al. Prevalence of amblyopia and strabismus in white and African American children aged 6 through 71 months: the Baltimore Pediatric Eye Disease Study. Ophthalmology 2009;116(11):2128-2134.

[17] Fu J, Li SM, Li SY, et al. Prevalence, causes and associations of amblyopia in year 1 students in Central China: the Anyang Childhood Eye Study (ACES). Graefes Arch Clin Exp Ophthalmal 2014;252(1):137-143.

[18] Dickey CF, Metz HS, Stewart SA, et al. The diagnosis of amblyopia in cross-fixation. J Pediatr Ophthalmol Strabismus 1991;28(3):171-175.

[19] Afsari S, Rose KA, Gole GA, et al. Prevalence of anisometropia and its association with refractive error and amblyopia in preschool children. Br J Ophthalmol 2013;97(9):1095-1099.

[20] Tarczy-Hornoch K, Varma R, Cotter SA, et al. Risk factors for decreased visual acuity in preschool children: the multi-ethnic pediatric eye disease and Baltimore pediatric eye disease studies. Ophthalmology 2011;118(11):2262-2273.

[21] Lois N, Abdelkader E, Reglitz K, et al. Environmental tobacco smoke exposure and eye disease. Br J Ophthalmol 2008;92(10):1304-1310.

[22] Chua B, Mitchell P. Consequences of amblyopia on education, occupation, and long term vision loss. Br J Ophthalmol 2004;88(9):1119-1121.

[23] König HH, Barry JC. Cost effectiveness of treatment for amblyopia: an analysis based on a probabilistic Markov model. Br J Ophthalmol 2004;88(5):606-612.

[24] Membreno JH, Brown MM, Brown GC, et al. A cost-utility analysis of therapy for amblyopia. Ophthalmology 2002;109(12):2265-2271.

[25] Kelly KR, Jost RM, De La Cruz A, et al. Amblyopic children read more slowly than controls under natural, binocular reading conditions. J AAPOS 2015;19(6):S15-S20.

[26] Mohan K, Saroha V, Sharma A. Successful occlusion therapy for amblyopia in 11- to 15-year-old children. J Pediatr Ophthalmol Strabismus 2004;41(2):89-95.

[27] Repka MX, Gallin PF, Scholz RT, et al. Determination of optimal penalization by vectographic fixation reversal. Ophthalmology 1985;92(11):1584-1586.

[28] Hrisos S, Clarke MP, Wright CM. The emotional impact of amblyopia treatment in preschool children: randomized controlled trial. Ophthalmology 2004;111(8):1550-1556.

[29] Holmes JM, Krakert RT, Beck RW, et al. A randomized trial of prescribed patching regimens for treatment of severe amblyopia in children. Ophthalmology 2003;110(11):2075-2087.

[30] Repka MX, Beck RW, Holmes JM, et al. A randomized trial of patching regimens for treatment of moderate amblyopia in children. Arch Ophthalmol 2003;121(5):603-611.

[31] Repka MX, Cotter SA, Beck RW, et al. A randomized trial of atropine regimens for treatment of moderate amblyopia in children. Ophthalmology 2004;111(11):2076-2085.

[32] Longmuir S, Pfeifer W, Scott W, et al. Effect of occlusion amblyopia after prescribed full-time occlusion on long-term visual acuity outcomes. J Pediatric Ophthalmal Strabismus 2013;50(2):94-101.

[33] Birch EE, Li SL, Jost RM, et al. Binocular iPad treatment for amblyopia in preschool children. J AAPOS 2015;19(1):6-11.

[34] Zhao J, Lam DS, Chen LJ, et al. Randomized controlled trial of patching vs acupuncture for anisometropic amblyopia in children aged 7 to 12 years. Arch Ophthalmol 2010;128(12):1510-1517.

[35] Li J, Thompson B, Lam CSY, et al. The role of suppression in amblyopia. Invest Ophthalmol Vis Sci 2011;52(7):4169-4176.

[36] Tsirilin I, Colpa L, Goltz HC, et al. Behavioral training as new treatment for adult amblyopia: a meta-analysis and systematic review. Invest Ophthalmol Vis Sci 2015;56(6):4061-4075.

[37] Al-Zaabi S, Al-Harthi I, Coomans P, et al. Compliance of amblyopic patients with occlusion therapy: a pilot study. Oman J Ophthalmol 2009;2(2):67-72.