A One-Year Review of Amblyopia Treatment for Literate Patients at King Chulalongkorn Memorial Hospital

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Objective: *To report the characteristics and the success rate of treatment of newly diagnosed amblyopia at Department of Ophthalmology, King Chulalongkorn Memorial Hospital between January 2007 and December 2007.*

Material and Method: *The authors performed retrospective chart reviews of 16 newly diagnosed amblyopic literate patients. Successful treatment was defined as having best corrected visual acuity (BCVA) ≥ 3 Snellen lines improvement or ≥ 20/30 in the amblyopic eye.*

Results: *Of 16 patients, the mean age was 8.62 ± 3.07 years old. The causes of amblyopia were 12 refractive error (75%), three strabismus (18.75%), and one visual deprivation (6.25%). The mean BCVA, before treatment, of amblyopic eyes was 0.74 ± 0.4 LogMAR and after treatment, BCVA was 0.41 ± 0.33 LogMAR. Seven (43.75%) patients were treated successfully whereas nine (56.25%) patients were not. No significant association was found between presenting age (p-value 0.92) (95% CI -3.59 to 3.72), cause of amblyopia (p-value 0.22) (95% CI -0.74 to 0.07), degree of refractive error (p-value 0.71) (95% CI -8.27 to 0.68) and treatment outcome.*

Conclusion: *Refractive amblyopia was the major cause of amblyopia in our clinic. Combined refractive correction and patching were the effective treatments of choice. Early diagnosis and prompt initiation of treatments will help achieve the optimal therapeutic outcome.*

Keywords: *Amblyopia, Strabismus, Refractive error, Visual deprivation, Patching*

Amblyopia is the condition that reduces unilateral or bilateral best corrected visual acuity (BCVA) without an exact causative agent. Abnormal visual experience in early life resulting from strabismus, anisometropia, high bilateral refractive errors (isometropia), or visual deprivation can cause amblyopia. It is a major public health problem when the visual impairment is lifelong[1]. Therefore, it is a diagnosis by exclusion. The reduction in visual acuity caused by amblyopia can be completely or partially reversed[2]. Prevalence estimates range from 2% to 3% depending on the population studied and the definition used[3-6]. Because amblyopia can be treated, it is important to identify factors that may lead to amblyopia early in a child's life to improve treatment outcomes.

The earlier amblyopia is detected and properly treated, the higher the success rate of improvement of visual acuity[7,8]. Starting treatment at a young age may also increase the likelihood of compliance and the rate of vision recovery[9]. The amblyopia treatment study demonstrated that more than 75% of amblyopic children younger than seven-years-old can have significant improvement in the amblyopic eye (to 20/30 or better) as a result of the treatment[10,11].

As there are different regimens in the treatment of amblyopia, the pediatric eye investigator group (PEDIGs)[10] reported their treatment results in amblyopic children under seven-years-old, at 6-month follow-up period, the patching eye (79%) developed quicker improvement than penalization eye (74%) while the best corrected visual acuity (BCVA) was equally around 20/30 or three more lines on Snellen eye chart. In addition, in other papers, the reported success rates were 31 to 82%.

The authors performed this retrospective study to determine the incidence, causes, and the treatment results of amblyopic patients at our pediatric

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clinic. As for the accurate results, the authors selected only the patients who were literate and understood how to read Arabic numbers.

Material and Method

The present study has been approved by the Ethics Committee of the Faculty of Medicine, Chulalongkorn University. The authors retrospectively reviewed the chart of firstly diagnosed amblyopia at the pediatric clinic, muscle clinic and refraction clinic of King Chulalongkorn Memorial Hospital, Thai Red Cross Society. All of them were first examined and diagnosed between January 2007 and December 2007. The follow-up time was at least six months.

Inclusion criteria included literate patients who were newly diagnosed as amblyopia. The exclusion criteria were illiterate patients, those who had been previously diagnosed, who had received previous surgery in the eye under study, who had ocular disease that led to reduce corrected visual acuity. The demographic data of the patients were recorded as age, sex, cause, treatment regimens, pre- and post-treatment LogMAR best corrected visual acuity (BCVA) and complications during treatment.

Definition of amblyopia[12]

The authors defined amblyopia as follows:
- Unilateral amblyopia was diagnosed when there were at least two lines of difference on Snellen BCVA between both eyes.
- Bilateral amblyopia was diagnosed while the Snellen BCVA of each eye was less than 20/40.

Moderate amblyopia[12]

The authors defined moderate amblyopia when Snellen BCVA in amblyopic eye was less than 20/40 to 20/100.

Severe amblyopia[12]

The authors defined severe amblyopia when Snellen BCVA in amblyopic eye was less than 20/100 to 20/400.

Successful treatment[10]

In the present study, the authors defined successful treatment when the post-treatment BCVA was $\geq$ 20/30 or improved from baseline $\geq$ 3 lines at six months. The therapeutic failure was when BCVA did not improve or improved but could not meet the success criteria.

Statistical analysis

All data were analyzed using SPSS for Windows software (version 15.0). Chi-square test and Mann-Whitney U test were used for comparison between groups, and subgroup analysis.

Results

The present study recruited 16 newly diagnosed amblyopic patients under the inclusion criteria. Even the authors found 20 amblyopic patients between January 2007 and December 2007. The demographic data was collected as in Table 1. Only 16 patients met the inclusion criteria. The age range of the patients was three to 13-years-old. The mean BCVA were 0.74 ± 0.4 LogMAR in amblyopic eyes and 0.16 ± 0.2 LogMAR in sound eyes, respectively.

There were 12 (75%) refractive amblyopia, three (19%) strabismic amblyopia, and one (6%) visual deprivation from congenital ptosis.

In the refractive amblyopia group after having refractive correction, 11 patients (69%) were treated by patching and the other patient (6%) was treated by penalization. The patching regimens were full-time patching and part-time patching. The full-time patching means the sound eyes will be patched all waking hours a day whereas less than six hours in the part-time patching. Four patients (25%) were in the full-time patching group and seven patients (44%) for part-time patching. Refractive correction by glasses was only prescribed in three patients (19%). Only one patient (6%) was atropinized with one drop

Table 1. Demographic data

Baseline characteristics	
Age (years)	8.6 ± 3.1
Sex (n)	
Male	7 (43.8%)
Female	9 (56.2%)
Visual acuity (LogMAR)	
Amblyopic eye	0.7 ± 0.4
Sound eye	0.2 ± 0.2
Refractive error (diopters)	
Amblyopic eye	-3.0 ± 4.7
Sound eye	-0.7 ± 2.3
Severity of amblyopia (n)	
Moderate	11 (68.8%)
Severe	5 (31.2%)

of 0.5% topical atropine before bedtime. Only one patient (6%) had surgical correction of congenital ptosis.

By the end of the present study, 12 patients (75%) completed the follow-up in six months. Within the present study, the authors found that seven patients (44%) met the successful treatment whereas in the other nine patients (55%) treatment failure was defined. The BCVA of the successful treatment were 0.12 ± 0.1 LogMAR. The seven patients (44%) maintained the treatment effect until their last visit. In the successful treatment group, one patient (14%) had only one treatment, whereas six other patients (86%) had more than one treatment regimen before success.

There was no significant association between presenting age (p-value 0.92) (95% CI -3.59 to 3.72), cause of amblyopia (p-value 0.22) (95% CI -0.74 to 0.07), degree of refractive error (p-value 0.71) (95% CI -8.27 to 0.68), and treatment outcome

Discussion

Amblyopia is curable and its causes are different. In the present study, refractive amblyopia was the major cause of amblyopia. It was more than strabismus as Attebo reported[4]. After having refractive correction, the patients were assigned to different regimens. Patching the unaffected eye or penalization for certain times is the basis of amblyopia treatment[12,13]. Nowadays, there are varieties of studies that try to shorten the treatment time.

In the present study, refractive correction with patching was the larger group among the study group. The authors found only one patient (14%) that received one treatment session and was successful after both the treatment and the long-term follow-up.

The study of PEDIGs[10] shows no significant difference in treatment results between the therapeutic effect of patching and atropine in the children less than 7-years-old. In addition, the onset of the treatment, causes of amblyopia, and refractive error did not affect the outcome of treatment.

In the present study the authors did not find the association between the type of amblyopia and the visual outcome while in most studies[14,15] reported the ranking from the best to the worst of anisometropic, strabismic, and combined strabismic/anisometropic amblyopia for visual acuity at initial visit[16,17] and outcome at the end of treatment. Some cases of anisometropic amblyopia can be partially or completely treated by means of refractive correction even though it seems hard to be properly treated.

However, as it was the retrospective study, there are several limitations such as the small sample size, the different regimens used in amblyopia treatment, and the number of patients that were lost to follow-up. Therefore, a larger the sample size and longer follow-up time with specific regimens would be desirable to confirm the results.

Refractive amblyopia was the major cause of amblyopia found at our clinic. Combined refractive correction and patching were the effective treatments of choice. The effective treatment of amblyopia will reduce the overall prevalence and severity of visual loss in population[18]. Early diagnosis and prompt initiation of treatments will help achieve the optimal therapeutic outcome. Therefore, repetitive therapy and close follow-up are mandatory.

Potential conflicts of interest

None.

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การศึกษาย้อนหลังภาวะตาขี้เกียจในผู้ป่วยที่รู้หนังสือในโรงพยาบาลจุฬาลงกรณ์ 1 ปี

ภาคภูมิ คัมภีร์พันธุ์, วิศรา ศรีสุวรรณวัฒนา

วัตถุประสงค์: เพื่อรายงานถึงลักษณะและผลการรักษาผู้ป่วยตาขี้เกียจที่พบใหม่ในช่วงเวลา 1 ปี ในแผนกจักษุวิทยา โรงพยาบาลจุฬาลงกรณ์

วัสดุและวิธีการ: การศึกษาเวชระเบียนของผู้ป่วยตาขี้เกียจใหม่ ที่สามารถอ่านตัวเลขได้ทั้ง 16 ราย โดยให้นิยามของการรักษาที่สำเร็จ หมายถึงผู้ป่วยจะต้องมีระดับสายตาที่ดีที่สุดเมื่อแก้ไขแล้วดีขึ้น ณ 3 บรรทัด เมื่อตรวจด้วย Snellen Chart หรือ ณ 20/30 ในตาข้างที่เป็นตาขี้เกียจ

ผลการศึกษา: ผู้ป่วยทั้ง 16 ราย มีอายุเฉลี่ย 8.62 ± 3.07 ปี สาเหตุของตาขี้เกียจ เกิดจากความผิดปกติของสายตา (Refractive error) 12 ราย (75%), ตาเข (Strabismus) 3 ราย (18.75%) และ Visual deprivation 1 ราย (6.25%) โดยทั้งหมดมีระดับสายตาที่ดีที่สุดเมื่อแก้ไขแล้วก่อนรักษาเท่ากับ 0.74 ± 0.4 LogMAR และหลังรักษาเท่ากับ 0.41 ± 0.33 LogMAR พบว่ามีผู้ป่วยที่ได้รับการรักษาจนสำเร็จ 7 ราย (43.75%) ในขณะที่ไม่สำเร็จ 9 ราย (56.25%) ไม่พบว่ามีความสัมพันธ์กันอย่างมีนัยสำคัญระหว่างผลการรักษากับอายุที่ตรวจพบครั้งแรก (p-value 0.92) (95% CI -3.59 to 3.72), สาเหตุของตาขี้เกียจ (p-value 0.22) (95% CI -0.74 to 0.07), ระดับค่าความผิดปกติสายตา (p- value 0.71) (95% CI -8.27 to 0.68)

สรุป: ภาวะตาขี้เกียจที่พบมากที่สุดในการศึกษานี้มีสาเหตุจากความผิดปกติของสายตา ดังนั้นการให้การแก้ไขความผิดปกติของสายตาร่วมกับการปิดตาข้างที่ดี เพื่อกระตุ้นการใช้งานในตาขี้เกียจจะเป็นการรักษาที่ประสบผลสำเร็จมากที่สุด ดังนั้นการตรวจพบในระยะเริ่มต้น และให้การรักษาในทันทีจะทำให้ประสบผลสำเร็จในการรักษา