

The Effect of Wearing the Full Cycloplegic Correction On the Angle of Deviation in Comitant Exotropia

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ABSTRACT

Purpose: To study the effect of wearing the full cycloplegic correction (FCC) on the angle of deviation in children with comitant exotropia.

Patients and Methods: A retrospective noncomparative chart review of children with comitant exotropia in whom the FCC had been worn for at least 3 months. The FCC was obtained by retinoscopy after instilling atropine eyedrops for 7 days. The angle of deviation for far vision, measured after 3 months of wearing the FCC was compared to the angle before. Data was analysed using IBM-SPSS version 20.

Results: One hundred and four children (55 females and 49 males) aged 0 to 15 years were included. The mean age was 6.2 ± 4.6 years. The mean age of onset was 1.7 ± 2.4 years with 54.8% occurring in the first year of life. The most common refractive error was hyperopic astigmatism (82/208 eyes; 39.4%). The angle of deviation for far was decreased in 30.8% (n=32) of cases. It increased in 33.6% (n=35) and remained unchanged in 35.6% (n=37) of cases. Orthophoria was seen in 7 cases (4.9%).

Conclusion: The FCC improved exotropia in a third of patients and a very small proportion of patients became orthotropic. Wearing the FCC should be recommended as the first step in the management of all strabismus, including exotropia.

Keywords

Strabismus, Exotropia, Cycloplegic correction, Angle of deviation.

Introduction

The prevalence of strabismus varies in different populations. In Cameroon, strabismus accounts for 1.3 of ophthalmic practice [1]. The exotropia: esotropia ratio is greater compared to western populations [2-4], with exotropia accounting for up to 63% of cases in one study [5].

Uncorrected refractive error may impair fusion and cause manifest deviations; therefore, correcting refractive errors is the first step

in the management of any strabismus. Glasses are prescribed and if any amblyopia is present, it is also treated. The full cycloplegic correction (FCC) might suffice in cases with accommodative esotropia [6]. Surgical correction is reserved for those cases where the deviation is significantly under-corrected despite full time glasses wear or following decompensation of a previously controlled deviation [7].

Non-surgical methods for the management of exotropia include spectacles [8,9], part-time patching and exercises (to improve the control of intermittent deviations [10]. Spectacle correction in intermittent exotropia has been shown to reduce the exodeviation

mostly in high hyperopic children; with no change reported in emmetropic and myopic children [11]. It may also reduce the angle in constant exotropia [12]. Partial or full correction may be prescribed. In our practice, we always prescribe the FCC.

The purpose of this study was to evaluate the effect of wearing the FCC on the angle of deviation for distance in children with primary exotropia.

Patients and Methods

The medical records of patients seen in a strabismus practice between June 1992 and June 2017 were reviewed. Institutional review board (IRB) approval was obtained from the IRB of the Yaoundé Central hospital.

The records of children aged 0 to 15 years old with primary exotropia who had been prescribed FCC and who returned for follow up visit at least 3 months after were included. Cycloplegic refraction was obtained by instilling one drop of Atropine twice daily for 7 days prior to refraction. Refraction was measured by retinoscopy. The angle of deviation (with the FCC) was remeasured by the alternate cover prism test. Variables analyzed include age, sex, age of onset, type of refractive error, initial angle of deviation for distance and the angle of deviation for distance with the FCC. Data analysis was done using IBM-SPSS version 20. The one-way ANOVA test, the Chi square test and the paired student t test were used for comparison between groups. Statistical significance was set at $p < 0.05$.

Results

A total of 104 children were included, among whom 55 females and 49 males. No patient had a developmental delay. The mean age at the first visit was 6.2 ± 4.6 years. The mean age of onset of exotropia was 1.7 ± 2.4 years. Exotropia was first noticed within the first year of life for 54.8% of cases.

Table 1: Distribution of type of refractive error in the study population

Type of refractive error	Number of eyes	Percentage
Hyperopia	43	20.7
Myopia	9	4.3
Hyperopic astigmatism	82	39.4
Myopic astigmatism	41	19.7
Mixed astigmatism	33	15.9
Total	208	100

Exotropia was constant in 42 cases (40.4%) and intermittent in 62 cases (59.6%). Nystagmus was present in 3.9% of cases ($n=4$) and amblyopia in 37.5% of cases at the first visit ($n=39$). The most common refractive error was hyperopic astigmatism, accounting for 39.4% of eyes ($n=82/208$) as shown in table 1.

The mean initial angle for distance was 31.7 ± 11.7 prism diopters (PD). The mean angle with the FCC for distance was 30.8 ± 14 PD. This difference was not significant ($p= 0.39$). Patients were divided into 3 groups based on the effect of the FCC on the angle of deviation. The deviation remained unchanged in 35.6% of cases ($n=37$); increased in 33.6% of cases ($n=35$) and reduced in 30.8% of cases ($n=32$). Table 2 shows the comparison between the initial angle and the angle with the FCC in each group.

Table 2: Angle of deviation in the various groups.

	Initial angle Mean \pm SD (PD)	Angle with FCC Mean \pm SD (PD)	p
No change	34.1 ± 13	34.1 ± 13	-
Increased	27.5 ± 7.8	35.9 ± 9.9	0.00001
Decreased	33.8 ± 12.7	21.6 ± 14.9	0.00001

Abbreviations: FCC, Full cycloplegic correction; SD, standard deviation; PD, prismatic diopters.

Hyperopic astigmatism was the most common refractive error in all 3 groups. It represented 40.6%, 40% and 34.4% respectively in the group with no change, increased and decreased deviation ($p=0.8$). There was no significant intergroup difference in the age of onset of exotropia and in the proportion of amblyopic cases (Table 3).

Table 3: Age of onset and proportion of amblyopia in the various groups.

	No change	Worse	Improvement	p
Age of onset Mean \pm SD (years)	2.2 ± 3.2	1.4 ± 1.5	1.5 ± 2	0.30
Amblyopia Proportion (%)	15/37 (40.6)	14/35 (40)	11/32 (34.4)	0.81

Seven patients (4.9%) were orthotropic with the FCC as shown in figure 1. Amongst those with orthotropia, the mean initial angle was 27.1 ± 13.6 PD (range: 12-50 PD). The deviation was intermittent in 6 cases and myopic astigmatism was found in 3 cases (Table 4).



Figure 1: Exotropia in left eye with right eye fixating (a); alignment of axes with the FCC (b).

Table 4: Clinical characteristics of orthotropic cases.

Characteristic	Number of cases/7	Percentage
Intermittence	6	85.7
Basic type exotropia	7	100
Myopic astigmatism	3	42.8
Hyperopic astigmatism	2	28.6
Hyperopia	2	28.6

Discussion

Few studies have evaluated the effect of the FCC on the angle of deviation in exotropia. Ebana et al. [13] reported a reduction in the angle of deviation in 23.8% of exotropic patients wearing their FCC; however, no case of orthotropia was noticed. Some authors have reported a reduction in the deviation with hyperopic correction, while others reported an increase. Iacobucci et al. reported a resolution of exotropia in a series of seven exotropic children after spectacle correction of hyperopia [12]. In a study on exotropia in children with high hyperopia, Kassem et al. reported a reduction or resolution in 67% (n=10/15) and no change in 13% amongst those who received their full correction [14]. They concluded that the full correction may result in a better outcome than partial hyperopic correction in children with high hyperopia.

On the contrary, Chung et al. reported an increase in the mean exodeviation in hyperopic patients [11]. The type of refractive error, however, did not influence the effect of the FCC on the deviation in our study. The most frequent type of refractive error in this series was hyperopic astigmatism, followed by hyperopia. Both hyperopia and hyperopic astigmatism have been reported previously as the most common type of refractive error in Cameroonian strabismic patients [15,16]. In the general Cameroonian population, hyperopia is the most frequent refractive error [16,17]. Although congenital nystagmus appears to be a predisposing factor for astigmatism [18,19]. This could not be verified in this study as only a very small proportion of children had nystagmus.

Kassem et al. theorized that by treating amblyopia with the full hyperopic correction, visual acuity and accommodation improved, thereby reducing the exodeviation [14]. In their study, 86% of cases had amblyopia. In this study, amblyopia was present only in 37.5% of cases and was not associated to improvement of the exodeviation with the FCC.

Most of the patients who became orthotropic in this study had intermittent exotropia. There is no consensus regarding the optimum type and timing of treatment for intermittent exotropia. Glasses is a management option with partial or full correction being prescribed, depending on the ophthalmologist's preference [20,21]. Some authors have achieved good outcome with overcorrecting minus lenses and recommend it as a primary treatment option [8,9]. It is based on the principle that an exodeviation will be decreased by stimulating accommodative convergence with additional minus power in spectacles. Others reported improvement with the full correction [12,14]. It is postulated that the improvement in visual acuity and, in some cases, the normalization of accommodation,

might lead to this result [22]. A limitation to our study is its retrospective nature. The non-availability of stereoacuity made it impossible to evaluate the effect of the changes in the deviation on the binocular sensory status in those with intermittent exotropia, as decreasing stereoacuity might depict early deterioration of fusion. There is need to continue to monitor the orthotropic patients for signs of manifest deviation.

Conclusion

Wearing the FCC improved exotropia in a third of the patients in this study. Those who became orthotropic presented mostly with intermittent exotropia. We recommend the prescription of the FCC as the first step of management in all forms of comitant exotropia.

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