Original Article

Association Between Refractive Errors and Heterotropia: A Counter Check

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Purpose: To determine an association between refractive errors and heterotropia.

Study Design: Cross sectional study.

Place & Duration of Study: Orthoptic clinic Mayo hospital Lahore from October 2015 to December 2015.

Material & Methods: Data was collected from the College of Ophthalmology and Allied Vision sciences, Eye OPD pediatrics clinic Mayo Hospital Lahore using a non-probability convenient sampling technique. Visual acuity of patients was recorded using VLC monitor at distance in decimal notation. Refractive error and Orthoptic assessment of the patients was later recorded for further analysis.

Results: A sample of 100 patients with heterotropia up to the age of 40 years was analyzed. The random composition of the male and female objects in the study was estimated to be 42% and 58% respectively. It was observed that hyperopia and hyperopic astigmatism were more prevalent in esotropia and emmetropia while myopia and myopic astigmatism were more common in exodeviations. The (p-value ≤ 0.000) confirmed an association between Refractive error and Heterotropia.

Conclusion: There is a strong association between Refractive error and Heterotropia.

Key Words: Refractive Errors, Heterotropia, Hyperopic Astigmatism.

Incidence of strabismus is 5-8% in the general population[1]. Typically, it encompasses a deficiency of harmonization between the two eyes, which prevents the gaze of each eye to the same point in space, thus inhibiting binocular vision and depth perception[2]. Most common types of strabismus are 'Exotropia' and 'Esotropia'. Exotropia is an outward deviation of the eye and usually starts at the age of 2-4 years. Exotropia may be constant or intermittent where inward deviation of one or both eyes occurs in esotropia. It can be constant or intermittent. Ametropia indicates presence of a refractive error[3,4].

The patient can get different ametropic conditions such as hypermetropia, myopia or astigmatism. For instance, Myopia is a type of refractive error where parallel rays of light coming from infinity are focused in front of retina when accommodation is at rest.[5]In addition, hypermetropia is also called long sightedness when parallel rays of light coming from infinity are focused behind the retina with accommodation at rest. Astigmatism is a type of refractive error where eye has different refractive powers in different meridians[6-9].

A large numbers of heterotropic population have refractive errors, which can positively or negatively affect the deviation. The main cause of the refractive errors is heterotropia, which is the main interest of the study. We carried out a perspective study to evaluate the association between refractive errors and heterotropia.

MATERIAL AND METHODS

An institutional based cross sectional data was collected from College of Ophthalmology and Allied Vision sciences, Eye OPD pediatrics clinic Mayo Hospital Lahore and a non-probability convenient sampling technique was used to collect the data. A sample of 100 patients (October 2015 to December 2015) with heterotropia up to the age of 40 years was examined for in the analysis. Data was collected by clinical examination and the findings were recorded in a self-designed proforma consisting of patient profile, strabismus history, visual acuity, motor assessment and diagnosis.

Visual acuity of patients was observed using visual acuity chart (VLC) monitor at distance and visual acuity of either eye was recorded in decimal notation. Refractive error and orthoptic assessment of the patients was also recorded for further analysis. Patients with cataracts, subnormal best-corrected visual acuity, nystagmus and aphakics were excluded from the study. SPSS (version 16) was used for statistical analysis and results.

RESULTS

There were 43% patients with emmetropia, 2% patients had myopia while 9% had hyperopia. 28% of the patients were having hyperopic astigmatism and 15% of the patients were found with myopic astigmatism while 3% had mixed astigmatism (Fig. 1).

Hyperopia and hyperopic astigmatism were more prevalent in esotropia whereas myopia, myopic astigmatism and emmetropia were more common in exodeviations (Fig. 2). No significant association between hypertropia and refractive errors was present. Subsequently the amount of deviation at distance in most of the patients was seen in the range of 26-45 prism diopter (PD), however 35% of patients showed deviation of 5-25 PD, 15% illustrated 46-65 PD and only 01% depicted 66-85 PD deviation. The distribution of patients according to the amount of deviation at near in majority of the patients lied in the range of 5-25 PD while 37% had 26-45 PD, 15% showed 46-65 PD, 5% showed 66-85 PD and 3% had 86-105 PD. A significant association between refractive error and heterotropia was confirmed with (Chi-Square = 40.044, df = 10 and p = 0.000) as shown in Table 1.

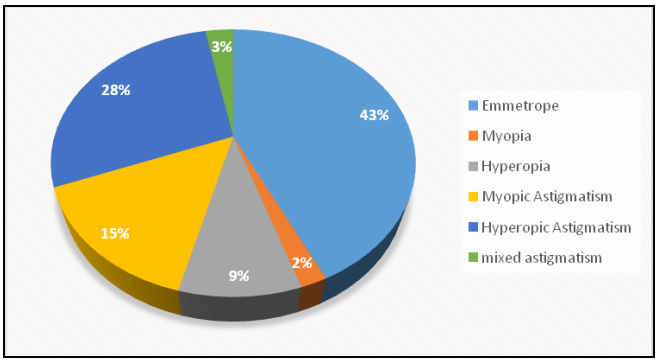

Fig. 1: Distribution of patients according to Refractive Error.

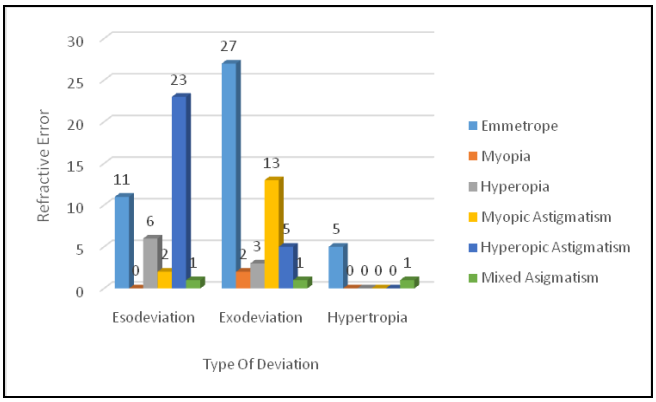

Fig. 2: Refractive Error and Type of Deviation.

Table 1: Refractive Error with Type of Deviation Cross tabulation.

Refractive Error	Type of Deviation			Total
	Esodeviation	Exodeviation	Hypertropia	
Emmetrope	11	27	5	43
Myopia	0	2	0	2
Hyperopia	6	3	0	9
Myopic Astigmatism	2	13	0	15
Hyperopic Astigmatism	23	5	0	28
Mixed Astigmatism	1	1	1	3
Total	43	51	6	100

Chi-square (40.044) ($p \leq 0.000$)

DISCUSSION

The basic purpose of this study was to counter check the association of refractive erorr with heterotropia. The study was carried out at the Pediatric Eye Clinic Mayo Hospital Lahore. World Health Organization has estimated that 153 million people worldwide live with visual impairment due to uncorrected refractive errors[10]. These anomalies of ocular alignment could have a strong association with visual acuity, which is the reciprocal of the minimal resolvable visual angle measured in minutes of arc for a standard test pattern[11]. In this study, association between refractive error and misaligned eye was counter checked. One hundred heterotropic patients aged between 4-40 years were included in the study. Females were more than males with a male and female percentage of 42% and 58%.

Exotropia commonly begins around age 2 to 4 years. It can appear at any age. Exotropia may be constant or intermittent[12-14]. Esotropia is a form of strabismus, in which one or both eyes turn inwards. The condition can also be constant or intermittent[15]. A study was conducted in population-based sample and the frequency of occurrence of ocular deviation and the carrier characteristics had been identified. Despite other factors, the association of the ocular deviation and refractive error, Esotropia and also Exotropia can be present in individuals with varying degrees of myopia (up to -5.75 for XT and -2.50 for ET) or hyperopia (up to +9.00 for XT and +8.00 for ET)[16].

A study concluded that strabismus was found in 45 of 170 children (26.5%), and Esodeviation was the most common type. 9 (20%) had Exodeviation and 4 (8.9%) vertical deviation. In 27 of 32 esotropic patients, the strabismus was regarded as acquired esodeviations. The frequency of strabismus was lowest in the high-grade hyperopia group (5%). Concerning esodeviations, fewer cases (3%) were in the high-grade hyperopia group. Most of the cases with esodeviations were in correlation with low-grade hyperopia (31%), myopia (28%) and emmetropia (16%). Hyperopia was the most common refractive error. Astigmatism was present in 72.4% of patients. Defocus in the peripheral retina associated with the misalignment of the eyes during near work might be the reason for the differences, considering the visual regulation mechanism of eyeshape[17, 18]. Another, study revealed that in children with intermittent exotropia, myopia was calculated to occur in more than 90% of patients. Observation versus surgical correction did not alter the refractive outcome[19,20].

In our study emmetropic population was 43% (43), myopes 2% (2), hypermetropes 9% (9) while myopic astigmatism was found in 15% (15), hypermetropic astigmatism in 28% (28) and mixed astigmatism was 3% (3). The Amount of deviation at distance and the number of patients in the range of 5-25 pd were 35% (35), in 26-45 pd were 49% (49) and in 46-65 pd were 15% (15) and in 66-85 pd were 1% (1). A significant association between refractive error and Heterotropia was found (Chi-Square 40.044) (p value 0.000). 62.8% emmetropes had exotropia while 25.6% had esotropia and 11.6% were hypertropic. All myopes in our study had Exotropia. In hyperopic patients, 66.7% had Exotropia and 33.3% had Esotropia. 86.7% with myopic astigmatism had Exotropia, 13% had Esotropia. In hyperopic astigmatism, 17.9% had Exotropia and 82.1% had Esotropia. 33% of mixed astigmatic patient had Exotropia, 33.3% had Esotropia and 33.3% had hypertropia. The limitation of our study was that the data was collected from only one tertiary care center. More studies are needed to find the situation across the country.

CONCLUSION

Our study confirmed that heterotropia is strongly associated with refractive errors. It is observed that hyperopia and hyperopic astigmatism was more prevalent in esotropia, emmetropia, myopia. Myopic astigmatism was more common in exodeviations.

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