Original Article

The Association between Refractive Errors and Congenital Ptosis

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Abstract

Background: Children with congenital ptosis need to be carefully assessed for refractive errors and visual function to identify and treat amblyopia which occurs in 20% of congenital ptosis, small amount of which is attributed to ptotic eyelid occluding the pupil. **Objectives:** The objective is to determine the frequency of refractive errors and its associations among children with congenital ptosis. **Patients and Methods:** Case–control study of 60 patients with congenital ptosis (79 eyes) and 60 patients without ptosis (control group) (72 eyes). Conducted in Ibn Al-Haithem Eye Teaching Hospital in Baghdad from April 2020 to May 2021. The main outcome measures were relative congenital ptosis, presence, and types of refractive errors. **Results:** Significant association was obtained between children with ptosis and average spherical and cylinder refractory error. Among 60 cases (79 eyes) of congenital ptosis, refractive errors were present in 26 eyes (32.9%) with the astigmatisms as the most common refractive errors (18.9%), followed by hypermetropia (8.9%) and myopia (5.1%). **Conclusions:** Children with congenital ptosis in our environment have greater refractive errors, early ophthalmic evaluation and timely treatment of these conditions may help prevent the irreversible visual impairment in case of congenital ptosis.

Keywords: Children, congenital ptosis, refractive errors

Introduction

Blepharoptosis or ptosis denotes droopiness of eyelid typically implies droopiness of the upper eyelid, unilateral or bilateral, congenital or acquired. Congenital ptosis is a condition present from birth and by history; the eyelid malposition has remained stable. Congenital ptosis is unilateral in 75% of cases; the remaining 25% are bilateral.[1]

Any children with congenital ptosis must carefully asses for refractive errors and visual function to identify and treat amblyopia which occurs in 20% of congenital ptosis, small amount of which is attributed to ptotic eyelid occluding the pupil. Others, such as isometropia, high causes are most important include astigmatism or strabismus. Some children need early assessment and treatment of ptosis is necessary when the visual axis is partially or completely obstructed because amblyopia and permanent visual loss are severing consequences. If the patient already demonstrates significant amblyopia, there is an extremely high rate of failure of ptosis surgery.[1]

Ptosis may occur from multiple causes including, Myogenic "mal development" ptosis (as simple congenital ptosis, blepharophimosis syndrome, double elevator palsy, congenital ocular fibrosis syndrome and muscular dystrophy), neurologic ptosis (as oculomotor nerve palsy, Horner's syndrome, myasthenia gravis and Marcus Gunn jaw-winking syndrome), aponeurotic ptosis (as evolutional "Apo neurotic dehiscence," posttraumatic, surgical and nonsurgical, blepharochalasis, and chronic and recurrent edema), Mechanical ptosis (as dermatochalasis, eyelid or orbital mass and scarring) and Pseudo ptosis (Globe malposition "enophthalmos, anophthalmos, hypoglobus," hypotropia, contralateral eyelid retraction, and dermatochalasis).[2]

The congenital ptosis can further divided into simple (most congenital ptosis may be autosomal dominant inheritance), complicated ptosis (with ophthalmoplegia may involve superior rectus, blepharophimosis, Marcus Gunn phenomenon,

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phenomenon of Marin Amat "reverse jaw-winking reflex," misdirected third nerve syndrome, Horner's syndrome), and mechanical ptosis (per orbital tumor, neuroma, neurofibroma and cicatricial skin changes).[3]

Refractive errors are common and more frequently responsible for amblyopia than the ptosis itself. It is the phenomenon of the bending of the light as it pass from one transparent medium to another of different densities. Types of refractive errors include hypermetropia in which parallel rays of right are brought to a focus some distance behind the sentient layer of the retina when the eye is at rest. This may be due to axial (the most common of all refractive anomalies each 1 mm shortening approximately three-dimensional of refractive changes), curvature (occurs when the curvature of any of the refracting surface of the eye is small, an increase of 1 mm of radius of curvature produce hypermetropia of 6D), and index hypermetropia (usually represents as a decrease in the effective refractivity of the lens, also due to background lens dislocation or absence lens).[4]

Myopia is that form of refractive error where parallel rays of light come to focus in front of the sentient layer of the retina when the eye is at rest. Myopia might be due to axial (increase in anteroposterior distance of the eye), curvature (increase curvature of the cornea or one or both surfaces of the lens, variation of 1 mm of radius of curvature of the cornea resulting in refractive change of 6D), and index (due to change in refractive index of the lens).[5]

Astigmatism is that condition of refraction where in a point focus of light cannot be formed on the retina. It may be due to curvature (if any high degree, has its seat most frequently in the cornea), error of centering of the lens (subluxation of the lens has a similar result), and index astigmatism.[6]

The current study was conducted aiming to determine the frequency of refractive errors and its associations among children with congenital ptosis.

Patients and Methods

A case–control study was done on 60 patients (79 eyes) with congenital ptosis under the age of 6 years who attended the Oculoplastic Department in Ibn-Al-Haithem Teaching Eye Hospital in Baghdad from April 2020 to May 2021.

The study also included 60 children (72 eyes) without ptosis under the age of 6 years who attended Sleigh Primary Health Center during the same period of the study after detailed history and information taken from the parents to exclude any ptotic eye serve as the control group.

After taking a full history, the children were examined by Snellen's visual acuity. For preschool children, Cat ford Vision drum was used and for infants' flashlight was used to see whether they followed the light or not. Palpebral fissure heights, levator function, and margin reflex distance were recorded. Such measurements were taken twice and the average was calculated and recorded. Bell's phenomenon, the presence of synkinesis such as Marcus Gunn jaw-winking phenomenon, lagophthalmos, upper lid crease, and variability of drooping also noted. Extraocular motility was checked in all positions of the gaze and was carried out in every patient.[7]

In preverbal children below 2 year old or uncooperative children, they were examined under general anesthesia in Ibn Al-Haithem Eye Teaching Hospital under cycloplegic refraction by atropine eye drop 0.5% or 1%, or by cyclopentolate 0.5% or 1% according to age (below 6 months 0.5%) using two drops of cyclopentolate 5 min elapsed between instillation of each cyclopentolate drop. Streak retinoscopy was performed a minimum of 30 min following instillation of the second drop of cyclopentolate.[8]

If fluctuation of the retinoscopy reflex was observed, additional drop of cyclopentolate was administered and the refraction was performed 30 min later. Cycloplegic autorefractor was attempted on all children. A maximum of three autorefraction attempts was performed. In the event that a reliable auto refraction measure could not be obtained, a study certified optometrist or ophthalmologist performed cycloplegic streak retinoscopy in a dimmy illuminated room using a retinoscopy with the child fixating at a distance for children with strabismus, the fellow eye was occluded while performing retinoscopy to prevent off-axis measurements. Children whose parents refused cycloplegia were not included in refractor our error analyses by retinoscopy in semi dark room with 1-m examination distance the spherical and cylindrical power and axis were noted for the right eye then for the left eye.[9]

The examination under cycloplegic refraction with or without direct or indirect ophthalmoscopy for examination of vitreous, optic disc, macula, and retina. Specific abnormality scar was noted, such as macular, disc hypoplasia, and retinoblastoma. Guidelines based on analyses and data management confidence intervals for prevalence estimate using the normal approximation where appropriate.[8]

Emmetropia was defined as a spherical equivalent (SE) refractive error of >−1.0 D and <+1.0. Myopia was defined as SE refractive error ≤−1.0 D and hyperopia was defined as SE refractive error ≥+1.0D.[7-9]

Astigmatism was defined as a cylinder power of 1.5 D or greater "equal to 1.0" in accordance with multiple studies within the literature. We assigned astigmatic type with the rule (WTR) if the plus cylinder axis was within 30 of 90, against the rule (ATR) if plus cylinder axis was within 30 of 180, and oblique if the plus cylinder was not WTR or ATR. We excluded from our study any pseudo ptosis as globe malposition or hyperopia, any traumatic ptosis.[7-9]

Data were presented as frequency and percentages with application of Pearson's Chi-squared test for testing the significance of association using $P \leq 0.05$ as the level of significance.

Ethics approval

This study was approved Ibn-Al-Haithem Teaching Eye Hospital in Baghdad .To ensure adherence to ethical guidelines, several measures were adopted while conducting this study:

1. Verbal consent was obtained from the participants before filling the questionnaire.
2. Participants were informed that their participation in this study is voluntary, no incentives or compensations will be offered in return, and that they have the right to withdraw from the study at any stage. The scientific value of their participation was explained in the verbal consent.
3. All the participants' information was kept private by keeping it in a secured folder in password-protected computer owned by the study investigators. No information

Results

The results revealed that in those patients with ptosis, astigmatism was found in 15 of the ptotic eyes which comprised 18.9% of all cases of ptosis while in control cases only two patients (2.8%). As hyperopia 7 ptotic eyes which account for 8.9% of ptosis patients while the control group three patients only (4.1%). Regarding myopia, there were 4 ptotic eyes (5.1%) in comparison to only two patients in the control group (2.8%). In general, the cases group has 26 ptotic eyes (32.9%) with emmetropia in comparison to 9.7% in the control group (7 patients) the association between congenital ptosis and presence of any refractive error was statistically significant ($P < 0.0003$), in addition, the association between type of refractive error and congenital ptosis was statistically significant [$P < 0.004$, Table 1 and Figure 1].

Table 1: The prevalence rate of three types of refractive errors

	Congenital ptosis group (79 eyes), *n* (%)	Control group (72 eyes), *n* (%)	*P*
Refractive error			
Emmetropia	26 (32.9)	7 (9.7)	0.0003*
No	53 (67.1)	65 (90.3)	
Type of refractive error			
Astigmatism	15 (18.9)	2 (2.8)	0.004*
Hyperopia	7 (8.9)	3 (4.1)	
Myopia	4 (5.1)	2 (2.8)	
No	53 (67.1)	53 (90.3)	

*Significant association using Pearson's Chi-squared test at 0.05 level

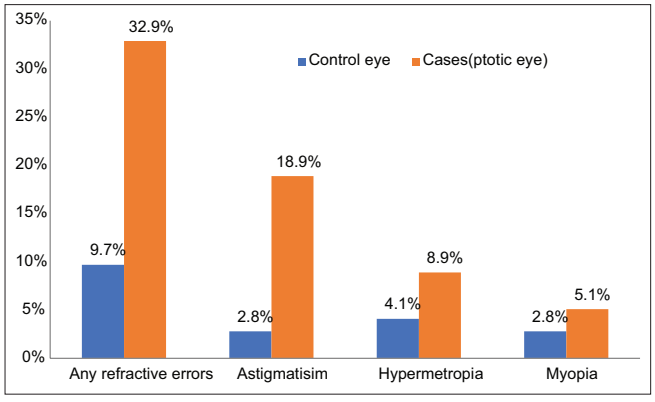

Figure 1: The prevalence rate of three types of refractive errors

Discussion

Ptosis is a significant problem both aesthetically and functionally. In our series of 60 cases of congenital ptosis (79 eyes), there was a significantly high prevalence of refractive errors (of any kind) in cases of congenital ptosis (32.9%) than that of control (9.7%). The congenital ptosis significantly increases of having any kind of refractive errors by 3.4 times compared to the control study. This higher proportion was nearly similar to the other previous study in congenital ptosis.[10,11]

Some studies had also reported higher refractive errors in congenital ptosis of up to 70%. The higher percentage of refractive errors in ptotic eyes than in the normal lid population was also reported by studies from Nepal and elsewhere.[12-14] Except few studies with higher refractive error in the normal lid population.[7,8,13]

Astigmatism was the most common type of refractive errors with congenital ptosis in our study like in other studies.[2,5,6,15] Unlike the finding in congenital ptosis, myopia was the most common refractive errors in normal school children.[10,12,13]

Conclusions

Patients with congenital ptosis have a higher rate of refractive errors and the most common type of refractive errors is astigmatism then hyperopia and myopia. Follow-up is essential for detection and management of refractive errors with early evaluation and timely treatment of these conditions.

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Conflicts of interest

There are no conflicts of interest.

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