The Impact of Eye Angle of Deviation and Direction on Visual Acuity (Counting Fingers) in Children Aged 9 to 15 years was investigated

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Abstract

The study goal was to analyze the relative high myopia with strabismus utilized for visual acuity testing in primary school students.

A total of 100 myopic individuals (spherical equivalent refraction [SER] fewer than 6.00 diopters) were included in this retrospective research. Male and female patients from the Baghdad College of Medical Technology clinic were included in the study.

Results**:** Overall, 100 patients including 58 male (58%) and (42%) female subjects with mean age of 11.9 ± 1.98 (range, 9 -15) years, right eye was (47%) and left eye was (53%) under consideration. Our study found that strabismus in elementary school patients was caused by excessive myopia and its causes. In this study, isotropic strabisms was also the most prevalent.

Keywords: *High Myopic, Primary School, Spherical and Esotropia in children.*

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دراسة تأثير اتجاه انحراف العين على حدة البصر (عندة حدة البصر الأصابع) لعمر 9-15 سنة

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الخلاصة

كان الغرض من الدراسة هو تقييم قصر النظر المرتفع النسبي مع الحول المستخدم في تقييم حده البصر لدى أطفال المدارس الابتدائية

أساليب : كانت هذه الدراسة بأثر رجعي ، وشمل ما مجموعة 100 مريض قصر النظر (الانكسار المكافئ الكروي [SER] اقل من 6.00 ديوبتر (D) . تم تضمين المرضى الذكور والإناث من جميع المرضى الذين خضعوا لعيادة كلية بغداد للتكنولوجيا الطبية .

النتائج : اخذنا 100 مريض منهم 58 ذكور (58 %) و 42 (42%) إناث بمتوسط عمر 11.9 $\pm$ 1.98 (المدى ، 18 – 5) ، العين اليمنى (47%)والعين اليسرى (53%) .

الاستنتاجات : أظهرت دراستنا أن الحول في مرضى الإبتدائية يعتمد على ارتفاع قصر النظر واسبابه . كما ان الحول الإنسي الأكثر شيوعاً في هذه الدراسة .

الكلمات المفتاحية : *قصر النظر ، المدرسة الإبتدائية ، كروي ، الحول الداخلي .*

1. Introduction

The human eye is one of the most remarkable sensory systems. The eye delivers visual impulses to the brain, which interprets them to produce a sensation of vision [1]. The eyeball is positioned in the eye orbit, which is formed by the bones of the skull. To cover the eyeball, a thin fatty layer and a thick layer of fatty tissue are used. [2]. To conduct a detailed assessment of the eye, it is important to have information about many things such as the external structures, the internal structures, the visual fields, and the visual reflexes [1]. During the clinical test, the capacity to identify the activation of the extra ocular muscles can be determined. The purpose of moving the eyes can be established by having the patient look in nine different directions.

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Begin with the primary gaze, then go on to secondary locations (up, down, to the left and right), and lastly to tertiary positions (up and right, up and left, down and right, down and left) [2,3]. Strabismus is an eye misalignment, where the eye is turned away from the object of regard. More than 2-4% of children [4,5] and as many as 4% of the adult population are affected by strabismus [6]. Strabismus often called "crossed-eyes" is a condition in which the eyes are not properly aligned with each other. One eye is either constantly or intermittently turned in (esotropia) or out (exotropia). This ocular misalignment may be accompanied by abnormal motility of one eyes, double vision, decreased vision, ocular discomfort, headaches, or abnormal head posture. Although the exact cause cannot always be determined with reasonable certainty, strabismus is usually attributable to refractive, sensory or anatomic or motor, or innovational causes [7,8]. The aim of this study was: to evaluate the relative high myopic with strabismus used for visual acuity assessment of primary school children.

2. Materials and Methods

A Retrospective study medical record review was performed for all patients diagnosed with high myopic who were visited Clinic of the College of Medical and Health Technology, this study consisted of 100 patients including 58 male and 42 female under consideration subjects with mean age of 11.9 ± 1.98 (range,9 -15) years. All patients underwent a complete ophthalmic examination and data collected included gender, age, past medical history, presence or absence of remarkable head trauma, presence of diplopia, visual acuity(VA), refractive error and presence of amblyopia. Routinely in Clinic of the College of Medical and Health Technology, (VA) was measured by Snellen's chart and express in Log Mar system for Far at 6 meter (m)and near 33 cm. Amblyopia was defined as a best-corrected VA of 20/30 or less in one eye or both eyes. The angle of deviation was measured by alternate prism cover test with the prism placed in the front of the paretic eye in 6 gazes; 1 and 2: near (33 cm) and distance (6 m) in primary position.

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We have designated as "congenital" those patients in whom the onset of strabismus was unknown or torticollis dated back to infancy. Congenital strabismus was confirmed based on the patient's childhood photographs, absence of diplopia, Combatant strabismus, a large range of vertical fusion vergence, and long-term history of strabismus. In contrary**,** acquired cases were diagnosed by the presence of diplopia, image tilting, history of marked head trauma and presence of non-Combatant strabismus, which occurred recently [9]. The collected variables were analyzed using SPSS-version 24 software (IBM, Armonk, NY, USA). Normal data distribution was tested by Shapiro–Wilk and according to normal distribution of the data, two-independent sample t-test was applied to determine statistically significant differences in some variables between congenital and acquired groups comparison. Mann-Whitney test were applied to compare quantitative variables between congenital and acquired groups. χ^2 was also used to evaluate the significant differences in quantitative variables such as gender and laterality in each group.

3.1. Measures\ Instrument

All measurement were done at Baghdad College of Medical Technology clinic, the VA was measured by Snellen' s chart Log Mar assessing the degree of the refractive error by auto- refractometer and the angle of deviation was measured by using prism bar.

3.1.1. Examination of the Eye

Tumbling chart: comprises rows of letters and is used by ophthalmologists and optometrist to estimate VA. This chart was developed at the National Vision Research Institute of Australia in 1979 and it is designed to enable a more accurate estimate of acuity than do other charts (e.g., The Snellen chart). For this reason, the Log Mar chart and Snellen chart are recommended in a research setting [10]. The result of visual acuity was converted to log MAR and Snellen chart measures. Far visual acuity is

determined first for the right eye and then for the left. A patch or occlude is used in front of the left eye as the acuity of the right eye is checked then vice vers [11]. Assessment of VA for distance with log MAR or Snellen chart at room illumination and binocular statue evaluation. The distant vision of a child was tested with the chart at 6. Finally, record report vision as shown in the table below the measurement of VA.

3.1.3. Near Visual Acuity

In this test for visual acuity include reading cards with graduated, small-standardized print with a near card; VA at 33cm is recorded [12].

3.1.4. Cover Test

Patients should be seated and asked to fix 33 cm at an accommodative target (near objective) without the best correct glasses being used by the patient. The first eye is closed as these eyes are covered for only 2 seconds. For any fixation change, the uncovered eye is examined, the occluder is then removed and any reification movement is then noted under binocular condition. First, any change in fixation UN occluded eye is covered similarly by the opposite eye, then remember that the procedure is replicated on both eyes with the patient-focused on a distant object (6m) [13].

3.1.5. Retinoscope

To reflex accommodation and sit arm's length from the infant, ask the child to fix on the distant goal. The retinoscope streak shines into the child's eye and more from the side and detects the motion beginning with the right eye: the same (with) motion requires plus power to correct and (against) motion requires minus power, adds sufficient power before you see a bright red reflex without any movement that fills the pupil to achieve neutrality. Rotate the streak with the axis 0 and look at the reflex in various meridians. With the left eye, execute the very same procedure. Before writing

the prescription, take the opposite of the working distance and deduct it from the final spherical correction [14].

3.1.6. Cyclopantolate

This test is important for assessing any patient problems related to binocular vision, and refraction with cycloplegic agents is ocular motility. Cycloplegic was administered with 1 drop of 1% cyclopentolate in the eye, repeatedly given once after 5 minutes. Cycloplegic dilation and pupil dilation were measured. Minimum waiting time of 30min. The pupils were assumed completely dilated at 6 mm or greater and the cycloplegic reflex was considered complete if there was no light reflex. Refraction was done first with a streak retinoscope [15].

3.1.8. Auto-Refractometer

Auto-Refractometer (Topcon KR-800, Technologies, Gamagori, Japan \2019) is video-enhanced, infrared photo refractive.

Common vision problems such as myopia or hyperopia are the result of refractive error. Auto refractors are used to measure the degree of refractive error in the eye and are suited well toward applications such as differentiating corneal from lenticular aberrations and assessing pre-and-post refractive surgery patients [16].

4. Results

This retrospective study was performed on 100 patients with esotropia, including 58 male (58%) and 42(42%) female subjects with mean age of 11.9 ± 1.98 (range, 8 -15) years.

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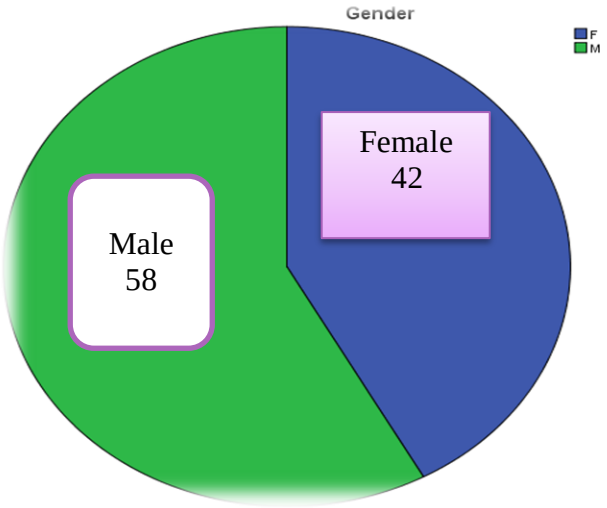

Fig. (1): The Distribution of gender for patients with unilateral Esotropic

Congenital and acquired etiologies were found in 47 (47%) and 53 (53%) patients, respectively (P<.001). Of 47 patients with congenital unilateral esotropia, 27 (59.6%) were males, and 20 (42.6%) were females. In addition, in the acquired group, the frequency esotropic in males and females was 31 (58.5%) and 22 (41.5%) patients, respectively.

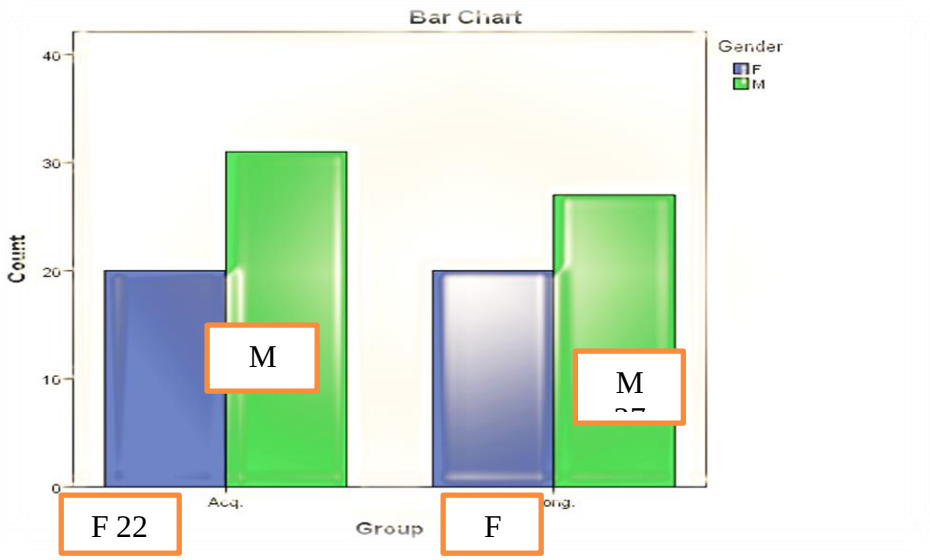

Fig. (2): Distribution gender in congenital and acquired esotropia.

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Of 100 patients who had cooperation for measuring, 47 (47%) patients congenital was 21 (44.7%) visual acuity (C.F) in Snell chart in the right eye and 26 (55.3%) patients had (C.F) in Snell chart in the left eye. Between 96 patients who had cooperation for measuring CDVA the prevalence of amblyopia was 100.0% (n=96) of whom mild, moderate, and severe amblyopia were found in 44 (45.8%) patients (30 congenital and 21 acquired), 20 (20.8%) patients (15 congenital and 5 acquired) and 32 (33.3%) patients (20) congenital and 12acquired), Respectively.

Table (1): The mean angle of deviation in different gazes

			Minimum	**Maximum**	**Mean**	***P*-value***
Primary position	**Hyper deviation**	Far	2.0 PD	50.0 Pd	15.5 ± 8.3PD	*P*<0.001
		Near	2.0 PD	45.0 Pd	14.7 ± 7.9PD	
	Horizontal deviation	Far	0.0	86.0 Pd	9.6 ± 6.9PD	*P*<0.001
		Near	0.0	88.0 Pd	10.3 ± 7.3PD	
Lateral gazes	**Hyper deviation**	Ipsilateral	0.0	50.0 Pd	10.1 ± 8.2PD	*P*<0.001
		Contralateral	2.0 PD	50.0 Pd	18.4 ± 9.8 PD	
	Horizontal deviation	Ipsilateral	0.0	30.0 Pd	8.8 ± 5.4 PD	*P*<0.001
		Contralateral	0.0	35.0 Pd	10.5 ± 5.9 PD	
Hyper deviation		Up gaze	0.0	40.0 Pd	10.7 ± 6.6 PD	P<0.001

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	Down gaze	2.0 PD	40.0Pd	12.9 ± 8.4 PD	
	Up gaze	2.0 PD	45.0 Pd	11.9 ± 7.9 PD	*P*<0.001
	Down gaze	0.0	30.0 Pd	9.0 ± 5.7 PD	

in table 1 we found the congenital strabismus was 56% divided to hereditary and not hereditary (71.4%, 28.6%) respectively, also the acquired strabismus was 36%. The causes of acquired strabismus divided to Trauma, accident and diseases (55.5%, 33.3% and 11.1%) respectively.

Table (2): Distribution causes refractive error in our study

Types of refractive error	Percent of %	Causes	Percent %
(56) Congenital	56 %	1. hereditary (40) 2. nohereditary (16)	71.4 % 28.6%
Acquired (36)	36 %	1. Trauma (20) 2. accident (12) 3. disease (4)	55.5 % 33.3 % 11.1 %

5. Discussion

This retrospective study was performed on 100 patients with esotropia, including 58 male (58%) and 42(42%) female subjects with mean age of 11.9 ± 1.98 (range, 8 -15) years. In our study the mean age similar to RAJAVE (2015) [17], MARTINEZ (2017) [18]. In our study, we found the high Myopia involved male more than female and the study by Helveston [19, 20] was the percent male 55.2% and female 44.7% was nearly from our study. The study by Yau G [20 ,21] was male 53.8% and female 46.2% close to our study.

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Conclusion

It was noted in this study that most of the patients (included) suffer from paroxysmal Amblyopia due to the presence of high myopia. We also noticed that the deviation angle for patients (under research) is more than 45 Pd. we acquired cases were diagnosed by the presence of diplopia, image tilting, history of marked head trauma and presence of non-Combatant strabismus and it was treated.

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