

The Evaluation Study of Visual Acuity (V.A) and direction of the angle deviation of Squint (Esotropia) and it's relation Ship to the Hypermetropia in Children

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Abstract

The current study aim to evaluate the visual acuity of squint (esotropia) and its' related to hypermetropia in children. The test of visual acuity without spectacles to the patient's eyes, refraction test by autorefractometer or retinoscope, then visual acuity with spectacles as well as the prescription measuring were done to all patients. Also, the angle of deviation was measured by corneal light reflex. Finally, the squint was corrected by wearing spectacles regarding the occlusion (close the normal eye). The value of the slope of esotropia is larger than exotropia because there is an overcorrection in the degree of myopia, so the slope is decreasing. The deviation in exotropia is decreasing, the overcorrection and the correction of deviation more rapid and positive in exotropia.

In esotropia note that the deviation rate was (22) has the highest number of patients, but with a different degree of correction. Also, the deviation rate of (12) contains several patients but with different degrees of correction, and the deviation rate of (27) contains one patient and is correct by +5.00 D.S.

We conclude the relationship between the degrees of squint is directly proportional to the refractive error of the patient, the rate of deviation (squint) increases in esotropia according to the convergence so it does not need a convex lens, the rate of deviation (squint) decreases in exotropia according to the divergence so it does need a convex lens and the uses of the correction lenses with a long time by the patient done good results to correct the squint. We recommended using corrective lenses is very important to correct the squint and refractive errors.

Keywords: Visual acuity, Direction of deviation, Squint, Esotropia, Hypermetropia in children.

دراسة تقييمية للحدة البصرية واتجاه الانحراف للحول (الحول الانسي) وعلاقته بمد البصر عند الاطفال

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الخلاصة

يُطلق على الحول المتقارب اسم الحول الإنسي. يتواجد معظم مرضى الحول الإنسي قبل سن المدرسة ، بشكل عام بين عمر 2 و 3 سنوات. هدفت الدراسة الحالية إلى تقييم حدة البصر للحول (الإنسي) وعلاقتها ببعد البصر لدى الأطفال. بدأت الدراسة الحالية في الفترة من 1 تشرين الثاني (نوفمبر) 2020 إلى 12 نيسان (أبريل) 2021 في مستشفى ابن الهيثم التعليمي وعيادة البصريات الاستشارية الخاصة في بغداد. شملت هذه الدراسة أربعة وخمسين (54) مريضاً ، ستة وعشرون منهم (26) ذكورا وثمانية وعشرون (28) أنثى قيد البحث وكانت تتراوح أعمارهم من 8 أشهر إلى 6 سنوات. تم تشخيص جميع المرضى الذين تم تسجيلهم في دراستنا بالعديد من الفحوصات والاختبارات البصرية من قبل أطباء العيون ثم فحصهم وفقاً لاستبيان الدراسة ، ثم اختبار حدة البصر دون نظارات العيون للمرضى. وكان اختبار الانكسار بواسطة مقياس الانكسار الذاتي أو منظار الشبكية ، ثم حدة البصر بالنظارات بالإضافة إلى قياس الوصفات الطبية لجميع المرضى. أيضاً ، تم قياس زاوية الانحراف من خلال انعكاس ضوء القرنية. أخيراً ، تم تصحيح الحول من خلال ارتداء نظارات متعلقة بالاغلاق (إغلاق العين الطبيعية). المرضى الذين يعانون من (+4.00 د.إ) لديهم نسبة عالية في الحول الإنسي ، والمرضى الذين يعانون من (-1.00 د.إ) لديهم نسبة عالية في الحول. قيمة منحدر الحول الإنسي أكبر من الحول الوحشي بسبب وجود تصحيح مفرط في درجة قصر النظر ، وبالتالي فإن المنحدر ينخفض. الانحراف في الحول الوحشي يتناقص.

الكلمات المفتاحية : الحدة البصرية , اتجاه الانحراف , الحول , الحول الانسي , مد البصر عند الاطفال .

Introduction

The methods performed by optometrists to deliver vision care and primary eye for an important serving of the American public and are frequently the origin health care practitioners to identify patients with strabismus [1]. One of both eyes has deviated as a squint state(strabismus), which can be paralytic (incomitant) or non_paralytic that occurs because of several reasons one of them the refractive error.

Usually, hypermetropia in young children and babies occurs genetically, but this should finally correct itself [2].

Some many factors and causes may involve in the strabismus incidence. Children who were hyperopia in infancy have been created to be further likely to develop strabismus. The consequence of childhood hyperopia can be recognized and finally results from the Refractive accommodative esotropia. An important exploring of refractive error consequence on the progress of different kinds of childhood strabismus is revealed in the many population-based research [3]. Many causes either sensory or motor in origin as well as can be as systemic disease expression (e.g., diabetes mellitus) or neurologic disorder (e.g., brain tumor) also in patients of all ages, trauma to the head or orbit may result in strabismus acquired in adolescence or adulthood (1).

Esotropia

One or both eyes turns inward as a type of strabismus that is called esotropia. It is the reverse of exotropia, the disorder can continually happen, or occur irregularly, and can provide the affected individual a “cross-eyed” appearance, fig (2-1). Esotropia is sometimes incorrectly termed “amblyopia”.



Fig. (2-1): left esotropia in children [1].

Types of esotropia according to causes

1- Infantile of esotropia

During the first year of life, the infantile form of the disorder starts with the inability to use their two eyes together. If one of the eyes turns inward more often than the other, the child is at advanced risk of amblyopia if one of the eyes turns inward more often than the other [3]. Surgery, eyeglasses, or, sometimes, botox injection are usually the methods to treat infantile esotropia. Before a child is 2 years of age, the correcting esotropia is regularly very successful [4].

2- Acquiring of esotropia

If the esotropia is developing in the life lately due to medical disorders, such as diabetes, or other eye problems, such as untreated farsightedness, in this state it is called “acquiring of esotropia”. People can treat the conditions with acquired esotropia successfully with vision therapy, glasses as well as surgery may be necessary for some.

3- Accommodative esotropia

The eye-crossing that occurs during the eyes trying hard to focus to see objects is called “accommodative esotropia”. The term “accommodation” is an attempt at focusing. People usually have farsightedness with accommodative esotropia. People can control accommodative esotropia by wearing prescription eyeglasses or contact lenses [4]. There is a hereditary factor to strabismus, as well as the state tends to paths

in families [5]. A doctor, ophthalmologist, or optometrist, who will examine the people's eyes with symptoms of esotropia as well as take a comprehensive family and medical history before carrying out eye examinations. The examination used will test for: Clarity of vision in both eyes together, Clarity of vision in each eye, farsightedness and Retinal function degrees, and how well the eye refracts light [6].

Treatment and management of esotropia

The state severity, the time length it has been present, one or both eye misalignment, as well as whether the esotropia is accommodative or not are the most important factors for the esotropia treatment. Treatment continually objects to Alignment of the eyes, double vision correction, dipping vision problems with both eyes, and amblyopia correction. Treatment options comprise:

1. Contact lenses or glasses: This is the first line of treatment repeatedly. Fig (2-2).
2. Botox injection: To rearrange the eyes of some people with mild esotropia botox may be needed to inject.
3. Vision therapy: To induce strengthen the eye function and the muscle around the eye, eye exercises improve vision. One form of vision therapy contributes a patch wearing over the unaffected eye to progress the crossed eye function, fig (2-3).

Surgery: surgical treatment needs by some people to change the state of the muscle around their eyes [7].



Fig. (2-2): - treatment of esotropia by glasses [4].

Esotropia that develops in later childhood otherwise adulthood can typically be achieved with contact lenses or glasses, as well as by treating any underlying disorder that may be developing to symptoms [7].



Fig. (2-3-A): treatment of esotropia by exercises [7].



Fig. (2-3-B): treatment of esotropia by exercises [7].

Exotropia

A common form of strabismus, characterized by eyes misalignment and reverse of crossed eyes due to the one or both eyes turn outward away from the nose, this condition is termed as exotropia [8]. Two different visual images are sent to the brain when the eyes don't focus together. One image is what the turned eye sees and the other image is what the straight eye sees. This can cause weaken the turned eye and final result in deterioration or loss of vision [9]. In some cases, the doctor may recommend surgery to eye muscles readjusting. In an adult, the surgery doesn't usually improve eyesight [10].

Diagnosis of exotropia

A diagnosis is usually made based on family history and vision testing. Ophthalmology or optometrist—the doctor who specializes in eye issues—is best equipped to diagnose this disorder. They'll ask you about symptoms, family history, and other health conditions to help them make a diagnosis. Your doctor will also conduct several vision tests. These can include Reading letters from eye charts if your

child is old enough to read, placing a series of lenses in front of the eyes to see how they refract light, and Tests that look at how the eyes focus. Using dilating eye drops to help widen the pupils of the eyes and allow a doctor to examine their internal structure [11]. Exotropia is common and treatable, especially when diagnosed and corrected at a young age. By about 4 months of age, the eyes should be aligned and able to focus [12]. Tests of long-sightedness are not found in most school screening programs. The evidence linking mild-moderate hyperopia and lack of progress in school are insufficient, although strengthened by recent findings of developmental problems in infants [13].

Patients and methods

The current study was commenced from 1st of November 2020 to 12th of April 2021 in Ibn Al- Haythem teaching hospital and private consulting optical clinic in Baghdad. This study involved fifty-four (54) patients, twenty-six (26) males, and twenty-eight (28) females with an age range from 8 months to 6 years.

All patients that enrolled in our study were diagnosed with many examinations and optical tests by ophthalmologists then checked according to the study questionnaire, then to the test of visual acuity (V.A) without spectacles to the patient's eyes, refraction test by auto refractometer or retinoscope, then visual acuity (V.A) with spectacles as well as the prescription measuring were done to all patients. Also, the direction of deviation was measured by corneal light reflex. Finally, the squint was corrected by wearing spectacles regarding the occlusion (close the normal eye).

Results

Traditional screening with VA chart and refraction under atropine using to examine the children. In table (1-1), the results showed the prevalence of squint related to age and gender of the child as well as in the figure (1-1) distribution of squint related to age and gender of a child. Distribution of squint found in females more than in males.

Table (1-1): Prevalence of squint related to the age of child and gender

	Gender		Age				
	Male	Female	0-1 year	2 years	3 years	4 years	5 years
Number of patient/54	26	28	9	14	10	11	10
Percentage 100%	48.15	51.9	16.7	25.9	18.5	20.4	18.5

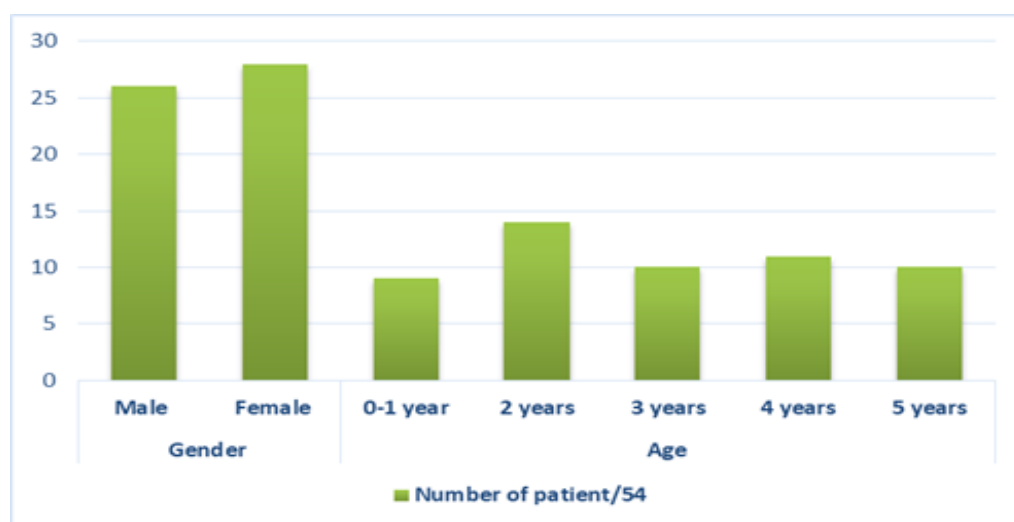


Fig. (1-1): distribution of squint related to the age of child and gender.

In the table (1-2) and (1-3), the results showed the prevalence of esotropia (thirty-three (33) patients) and exotropia (twenty-one ((21) patients) in the right and left eye, the figure (1-2) and (1-3) revealed the distribution of esotropia and exotropia related to the degree of refractive error so that the patients with (+4. 00D.S) be the high rate in esotropia, patients with (-1. 00D.S) be a high rate in exotropia.

Table (1-2): Prevalence of esotropia of right and left eyes

Degree of refractive error for esotropia of L.t eye	Number of patients / 33	Percentage 100%	Degree of refractive error for esotropia right eye	Number of patients / 33	Percentage 100%
0,00	1	3,03 %	+ 3,00	2	6,06 %
+ 1,00	0	0	+ 4,00	9	27, 27 %
+ 2,00	1	3,03 %	+ 5,00	6	18,18 %
+3,00	4	12,12 %	+ 6,00	6	18, 18 %
+ 4,00	8	24,24 %	+ 7,00	4	12,12 %
+ 5,00	6	18,18 %	+ 8,00	2	6,06 %
+ 6,00	4	12,12 %	+ 9,00	2	6,06 %
+ 7,00	4	12,12 %	+ 10,00	2	6,06 %
+ 8,00	3	9,09 %			
+ 9,00	1	3,03 %			
+ 10,00	1	3,03 %			

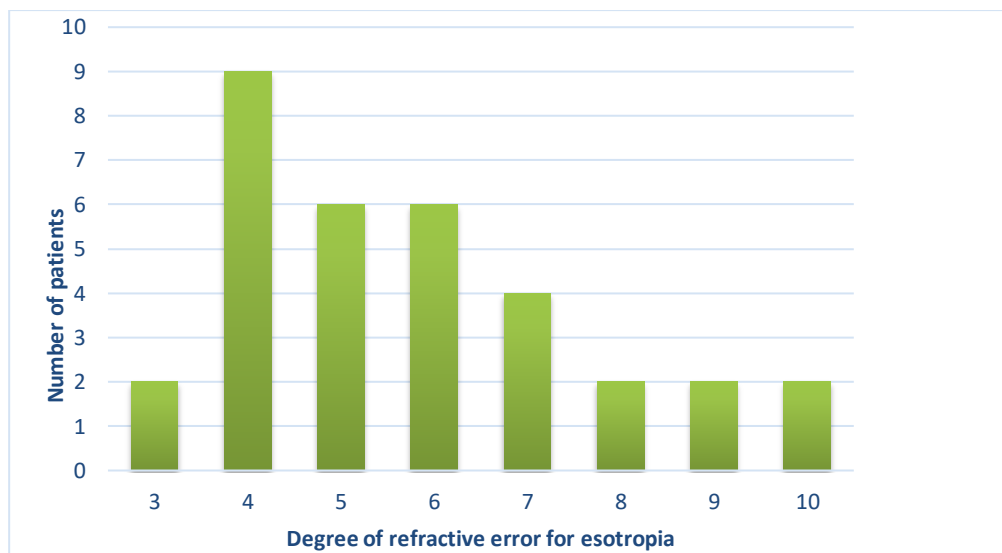


Fig. (1-2-A): distribution of esotropia of right eye

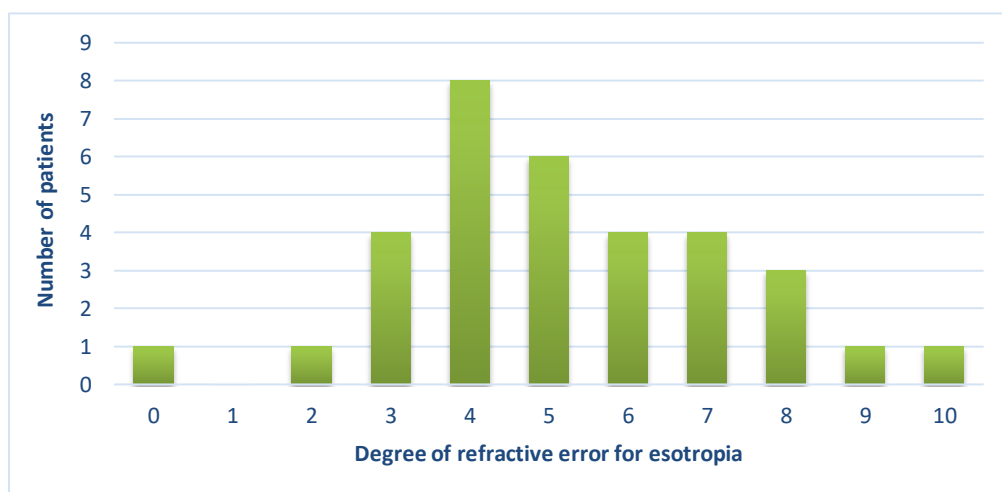


Fig. (1-2-B): distribution of esotropia of left eye.

Table (1-3): Prevalence of exotropia of right and left eye

Degree of refractive error for exotropia(right eye)	Number of patients/21	Percentage 100%	Degree of refractive error for exotropia(left eye)	Number of patients/21	Percentage 100%
0.00	3	14.29%	0.00	4	19.15%
-1.00	5	23.81%	-1.00	4	19.15%
-2.00	1	4.76%	-2.00	3	14.29%
-3.00	2	9.52%	-3.00	0	0
-4.00	3	14.29%	-4.00	2	9.52%
-5.00	4	19.05%	-5.00	3	14.29%
-6.00	1	4.76%	-6.00	0	0
-7.00	0	0	-7.00	2	9.52%
-8.00	1	4.76%	-8.00	1	4.76%
-14.00	1	4.76%	-13.00	1	4.76%

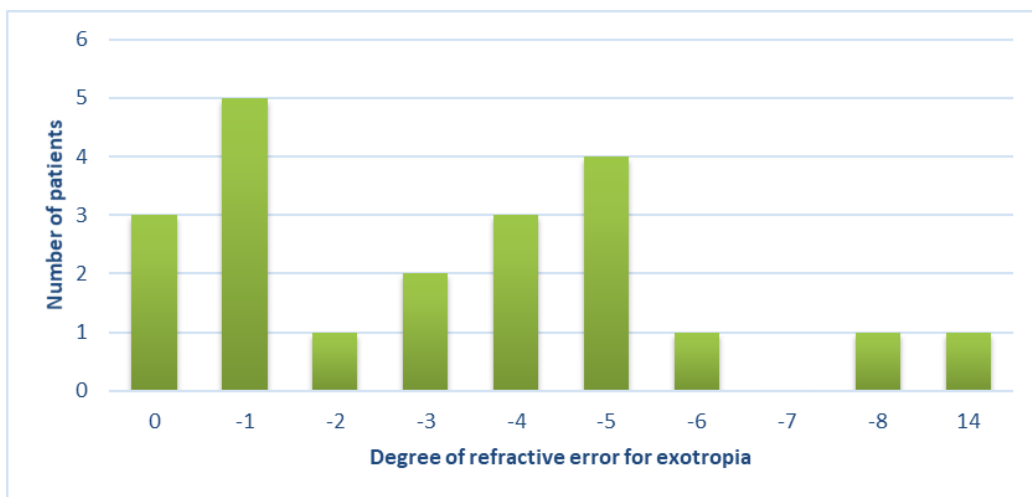


Fig. (1-3-A): Prevalence of exotropia of right eye

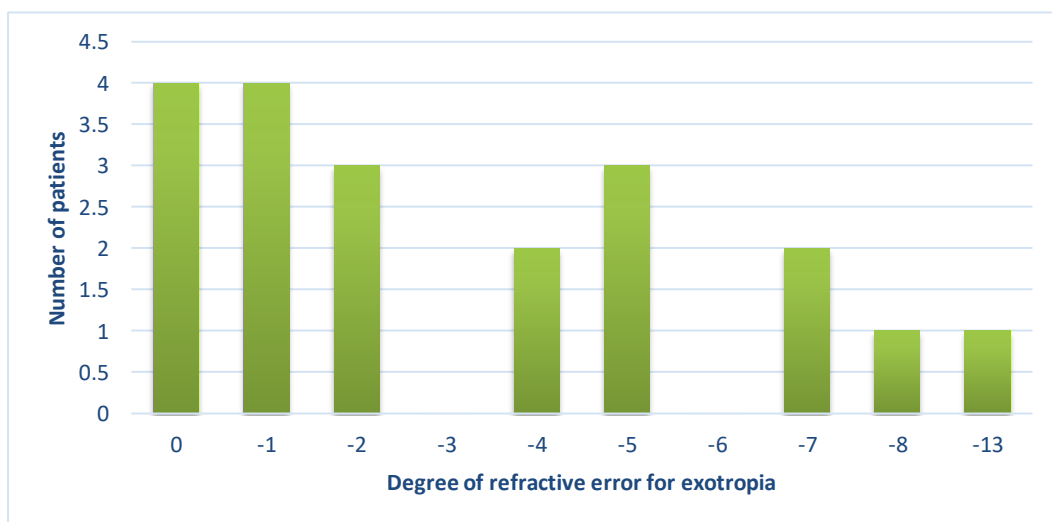
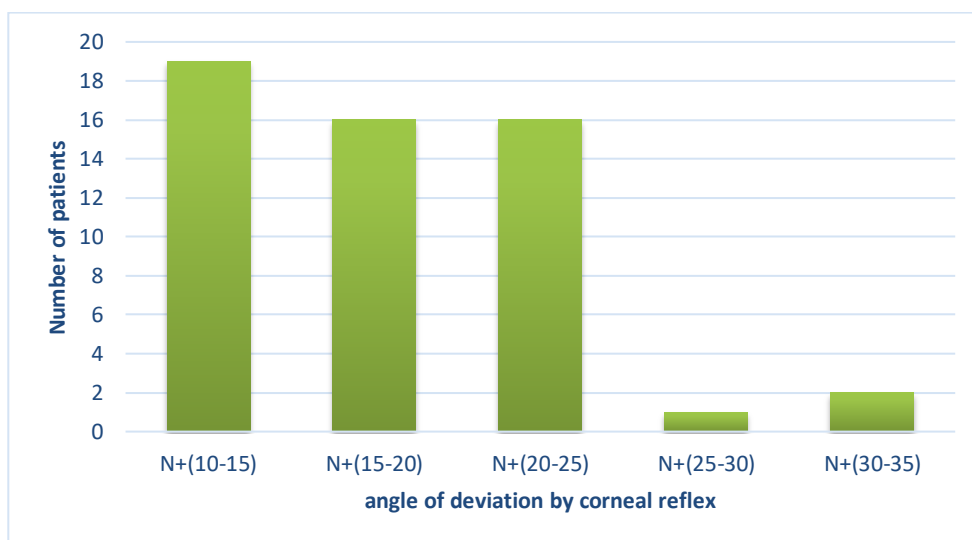


Fig. (1-3-B): Prevalence of exotropia of left eye

In the table and figure (1-4), the results revealed the prevalence of angle of deviation by corneal reflex, it is a high rate of patients (35.19%) in corneal reflex N+ (10-15), and in the figure (1-5) the distribution of the results of the direction of deviation by corneal reflex.

Table (1-4): Prevalence of angle of deviation by corneal reflex

angle of deviation by corneal reflex	Number of patients/54	Percentage 100%
N+(10-15)	19	35.19%
N+(15-20)	16	29.63%
N+(20-25)	16	29.63%
N+(25-30)	1	1.85%
N+(30-35)	2	3.70%

**Fig. (1-4):** distribution of direction of deviation by corneal reflex.

Discussion

Tests of long-sightedness are not found in most school screening programs. The evidence linking mild-moderate hyperopia and lack of progress in school are insufficient, although strengthened by recent findings of developmental problems in infants (13). The value of the slope of esotropia larger than exotropia because there is overcorrection in a degree of myopia, so the slope is decreasing. (Overcorrection in x-axis of exotropia) (Longer than real) slope = y/x equation of line is $y=mx+c$ where m is the slope and c is constant so $m=y_1-c_1/x_1$ in esotropia, $m=y_2-c_2/x_2$ in exotropia. In esotropia the slope is larger than m of exotropia because the value of c in esotropia is negative and $y-c = y-(-c) = y+c$, so m is large, in exotropia is positive and $y-c$ small, so m is smaller than m of esotropia. The deviation in exotropia is decreasing, a cause the overcorrection and the correction of deviation more rapid and positive in exotropia.

In esotropia note that the deviation rate (22) has the highest number of patients, but with a different degrees of correction. Also, the deviation rate of (12) contains many the patient but with different degrees of correction, and the deviation rate of (27) contains one patient and is correct by +5.00 D.S. Note in esotropia the (slop) be high and correct by +9.00D.S, and not correct by overcorrection because the esotropia is (convergence) do not need to overcorrection, it increases the deviation (squint) in the patient. In exotropia not that the deviation rate of (17) has the highest number of the patient but with different degrees of correction, the deviation rate of (22) contains on some the patient but with different degrees of correction, and the deviation rate of (12) contains the lowest number of patient and also with different degree of correction.

In exotropia note, the (slop) below, need to overcorrection because the exotropia is (divergence) need overcorrection (divergence lens) like -14. 00D.S so reduced the deviation ratio (squint) in patients.

The study results agree with the results of Sundus (2018), the results of its study used 100 cases of children 5 months to 5 years of age to identify the association between refractive error mainly Hypermetropia and childhood esotropia and exotropia. The major potentially risky refractive errors for esotropia were Hypermetropia of 1.25 to 8 D or more as Hypermetropia in children. Is usually genetic, Babies and young children may suffer from Hypermetropia, but this should eventually correct itself. This happens as the eyeballs lengthen as they grow. However, a lazy eye may develop as a result. This is because the eye with the weakest vision is ignored by the brain. If this is not corrected in young children, there is a risk that the weaker eye will never see as the other eye, where is squint happens.

Conclusions

We conclude from the current study that:

The relation between the degrees of squint is directly proportional to the refractive error of the patients.

Recommendations

- 1- Include More cases, and making a comparison between the children and adults.
- 2- The children should be screened for eye health before the age of six months old.
- 3- Through eye examination, must be performed by an ophthalmologist or optometrist and is recommended when the child is between the ages of 3 and 5 years.
- 4- Making a comparison between the horizontal deviation and the vertical deviation.

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