Clinical Features of Patients attended Orthoptic Clinic of Al-neelain University Eye Hospital

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Abstract

Background: Binocular anomalies are one of the major causes of headache and other annoying symptoms, manifest strabismus not only caused cosmetic problem but also induced amblyopia and other sensory problems. Non strabismic anomalies can develop to strabismus if untreated so determining prevalence of different binocular anomalies and related features is important (1). **Aim**: To assess clinical features of patients attended the orthoptic clinic of Al-neelain university eye hospital. **Material and Methods**: A retrospective hospital based study was conducted in the orthoptic clinic of Al-Neelain university eye hospital in the period from October 2018 to June 2019. (304) patient's records were included in this study, both genders were considered. Required information included age, gender, visual acuity, type and amount of refractive errors, type and amount of deviation and assessment of binocular functions, this information obtained from files of patients and was recorded in the research form. **Results**: The findings revealed vast majority 70.7% of patients were females, the age group most represented were teenagers with 46.4%. Headache during reading was the most common ocular complaint found in 45.2% of patients, followed by ocular pain during concentration 23.7%. The more prevalent binocular vision anomalies was convergence weakness exophoria 45.4%, convergence insufficiency 20.4% and esotropia 12.5%. The majority of patients 98.4% had abnormal convergent fusional vergence at near with mean of 13.4±5.75 Δ base-out, while 80.8% had abnormal divergent fusional vergence at near with mean of 7.21±3.29Δ base-in. About 27.69% of patients have abnormal near point of convergence; more than 10cm with mean of 9.13±3.63 cm. **Conclusion**: Binocular vision anomalies were common among females with convergence weakness exophoria and convergence insufficiency being the predominant anomaly. Headache was common prevalent among patient with binocular vison problem. Therefore, efforts should be made for early detection and treatment of binocular anomalies to avoid their impact on quality of life and productivity.

Keywords: Binocular anomalies, convergence weakness, convergence insufficiency

Introduction

Binocular single vision defined as the state of simultaneous vision, which is achieved by the coordinated use of both eyes, so that separate and slightly dissimilar images arising in each eye are appreciated as a single image by the process of fusion (1). In normal vision, both eyes are precisely aligned on an object of regard, so the images from that object fall on the fovea of each eye. Precise image orientation on corresponding retinal areas of each eye permits cortical processing, which results in the merging or fusion of the two images, this process is termed binocular fusion. Thus binocular vision implies fusion, the blending of sight from the two eyes to form a single percept. (2)

The phenomenon of binocular vision has three different components: simultaneous perception defined as the ability to perceive simultaneously two images, one formed on each retina, fusion is the faculty of producing a composite picture of two similar objects, each of which is incomplete in a different manner and stereoscopic vision is the perception of the relative depth of objects on the basis of binocular disparity (3). Proper functioning of binocular vision without

symptoms depends on a number of factors, which can be considered under three broad headings : anatomy of the visual apparatus, motor system that coordinates movement of the eyes, and sensory system through which the brain receives and integrates the two monocular signals, Anomalies in any of these can cause difficulties in binocular vision, or even make it impossible (4). The basic visual functions are innate and therefore, present at birth early postnatal period. Therefore, any obstacle during this period may cause abnormalities in development of binocular and function. (5)A unilateral or bilateral blurred retinal image or strabismus will disrupt early visual development and can cause permanent visual loss. (2)

Normally the eyes are well aligned so the foveas are aimed on the same visual target; this is termed orthotropia. Strabismus is the term for ocular misalignment, or if there is an underlying tendency toward misalignment. Since the position of rest is usually of a slight divergence, only a few people are really orthophoric, hence some degree of heterophoria is universal. (6) A manifest misalignment is called a heterotropia or tropia for short. In contrast, a hidden tendency for an eye to drift is termed heterophoria or phoria. Patients with a phoria have a latent deviation and use motor and sensory fusion to maintain proper alignment. Orthophoria is a condition of perfect alignment of the two eyes which is maintained even after the removal of influence of fusion (7), (4).

Binocular vision anomalies are among the most common visual disorders they are usually associated with symptoms such as headaches, eye strain, eye pain, blurred vision (8). These anomalies result in confusion, diplopia which leads to suppression, eccentricfixation, anomalous retinal correspondence and amblyopia (9).

Binocular vision anomalies include sensory and motor disorders, sensory disorders can be anisometropia, spasm of accommodation and accommodative facility and motor disorders can be latent and manifest strabismus and vergence system disorders such as convergence insufficiency (10), (11).

Pickwell et al reported that between 18% and 20% of patients consulting a primary care optometrist have a near heterophoria that has the signs and symptoms indicating that it may be a decompensated heterophoria. Some authors give even higher prevalence figures so it could be said that every eyecare practitioner needs to have a working knowledge of binocular vision anomalies (4). To our knowledge no study has been conducted in Sudan about the clinical features of the patients with binocular vision anomalies, therefore, this study was performed to assess clinical features of patients attended the orthoptic clinic of Al-Neelain university eye hospital Khartoum Sudan.

Material and methods

This was retrospective hospital based-study conducted to evaluate clinical features of patients attended binocular vision clinic at alneelain university eye hospital in Khartoum state. Study included all patients attended the clinic in period from October 2018 to June 2019, 304 patients were selected from records of binocular department., their age ranged from (2 years to 45 years), both genders were considered (89 males and 215 males).

Distant visual acuity was measured monocularly and then binocularly using Snellen's chart. The refractive state of the eye was determined by using retinoscope (cycloplegic refraction was performed in children). Assessment of binocular vision and detect direction and frequency of deviation by the cover test in which occluder and fixation target at near 33cm were used. Measurement the angle of deviation was performed by prism bar cover test in which prism bar was use over the patient's deviating eye with the prism present and patient asked to fixate in a target, then alternate cover test was

performed and patient's eye was watched for movement, prism bar was increase power until there was no movement this test performed for distance and near. Near positive and negative fusional vergences were measured by prism bar placed in front of one eye, power was gradually increased and the patient was asked to report when the target (33cm) become double, near point of convergence was measured using RAF rule. Evaluation of eye movement and muscle action were performed by ocular motility test.

The collected data was analyzed statistically by using IBM SPSS Statistics 22.00 for windows program; Standard deviation and percentages were used to determine the descriptive statistics.

Results

Demographic characteristics of participants

This study included 304 subjects; 70.7% were females and 29.3% were males, their ages ranged from 2 to 45 with a mean of 16.4±6.84 SD years. The age group most represented were the teenagers (15-24years) with 46.4% and the groups of least represented were children (< 15years) and young (25-45yaers) with 41.8% and 11.8 % respectively. The differences between the mean ages of males and females was statistically not significant (ANOVA: F = .081, p = .897).

Distribution of symptoms among the participants

Headache during reading was the most common ocular complaint found in 45.2% of patients followed by ocular pain during concentration 23.7%, while the least symptom represented 0.3% was movable image during reading which was found in one subject as shown in table 1.

Distribution of refractive errors among participants

Almost 65.8% subjects were emmetropic, about 17.1% have mild degree of myopia of -3.00 D followed by 7.5%have moderate hypermetropia (3.25 to 6.00D) and about6.9% have mild degree of hypermetropia (0.25 to 3.00), as shown in table 2.

Table (1) ocular complaints among subjects

Ocular Symptoms	%
For check up	3.0%
Headache	45.2%
Difficulty in fixation	6.3%
Ocular pain during concentration	23.7%
Blurring at near vision	6.6%
Blurring at distant vision	3.3%
Squint	9.2%
Itching and tearing during fixation	2.6%
Movable image during reading	0.3%
Total	100.0

Table (2) Refractive errors among participants

Refraction	%
Emmetropic	65.8%
Mild hypermetropia (0.25-3.00D)	6.9%
Moderate hypermetropia (3.25-6D)	7.5%
Significant hypermetropia> 6 D	0.9%
Mild myopia (0.25-3.00D)	17.1%
Moderate myopia (3.25-6D)	0.9%
Significant myopia> 6 D	0.0%
Total	100.0

Fusion

The vast majority of patients 98.4% had abnormal convergent fusional reserve with mean of 13.4±5.75Δ base-out ranged between 4 to 40Δ base-out, while 80.8% had abnormal divergent fusion with mean of 7.21±3.29Δ base-in ranged between 0 to 20 Δ base-in.

Near point of convergence (NPC) among participants

About 72.32% of patients have normal near point of convergence (NPC), while 27.69% have abnormal NPC; more than 10cm with mean of 9.13±3.63 SD cm and ranged from 5 to 30 cm.

Binocular anomalies among participants

Convergence weakness exophoria represented most common binocular anomalies among subjects (45.4%) followed by convergence insufficiency (20.4%) and esotropia (12.5%). Convergence excess esophoria represented

(8.6%), weakfusion(3.3%), exotropia (3.0%), basic esophoria (1.6%), basic exophoria (1.6%).

Table (3) Binocular anomalies among the participants

Binocular anomalies	Frequency	Percent
Convergence insufficiency	62	20.4%
Convergence weakness exophoria	138	45.4%
Normal muscle balance	9	3.0%
Divergence excess exophoria	1	0.3%
Basic exophoria	5	1.6%
Convergence excess esophoria	26	8.6%
Divergence weakness esophoria	1	0.3%
Basic esophoria	5	1.6%
Weak fusion	10	3.3%
Esotropia	38	12.5%
Exotropia	9	3.0%
Total	**304**	**100.0**

Discussion

This study revealed the vast majority of patients attended binocular vision clinic were females this is agree with Damaris, et al. 2018(12), they found that out of 131 patients attending orthoptic clinic 61.83% of them were females. The most common age group affected in this study was teenage group, this is agreeing with Pritam et al. 2017(13) who found that the prevalence of binocular anomalies was 67.35% among young subjects. From this result of current study effort should increase to detect and manage binocular vision problems as early as possible since associated symptoms may have serious implications in social and academic activities.

Assessment of the symptoms in this study showed that headache was the most common ocular complaint among patients followed by ocular pain during concentration, this results disagree with Godwin et al. 2016(14) who found that 35% of patients attending binocular vision clinic complained of diplopia during reading, 27% having blurring of vision and 24% suffering from headache.

Most studies shows differences in the prevalence rate of refractive errors that most of them were conducted in pediatric age group , prevalence of refractive errors in this study was 34.2%.

In this study the most common binocular vision anomalies were convergence weakness exophoria followed by convergence insufficiency. In a study by Martin et al. 2019(15) they reported that the three most common binocular anomalies were basic exophoria, convergence insufficiency and divergence insufficiency. This study revealed that exophoria was more than esophoria, exophoria was highly prevalent at near fixation, and for distant fixation orthophoria was predominated, same findings found by Leoneet al. 2010(16).Prevalence of esotropia in this study was higher than exotropia, that is disagree with study conducted in Iran by Hashemi et al. 2018(17) who found that prevalence of exotropia (3.87%) more than esotropia (0.43).

Abnormal near point of convergence was noted in 27.69% of patients and that is compatible with result obtained by vaishali et al, 2019(18) they found that (27.5%) of patients attending binocular vision clinic have abnormal near point of convergence .There was significant difference between age groups according to NPC in this study that abnormal NPC were more common among teenage group, and that differs from results by Hassanet al 2016(19) they found that Abnormal near point of convergence among different age groups showed no significant linear trend, however a significant increase was observed after the age of 60 years.

In this study low near fusional vergences values were obtained, different findings obtained by Rowe (20) et al 2010 and Godwin (14) et al 2016 who found high values of near fusion among their subjects.

Prevalence of amblyopia in this study was higher 5.26% than that reported in previous studies, in a study by Mohsen(21) and others et al 2011 prevalence of amblyopia was (2.67%), in a study by Mogaddam(22) et al 2008 a prevalence of amblyopia of 1.03% has been reported. Prevalence of amblyopia in different populations is not identical and factors such as age and criteria used to determine amblyopia in each study might justify those differences.

Conclusion

Binocular vision anomalies were common among females with convergence weakness exophoria and convergence insufficiency being the predominant anomaly. Headache was common prevalent among patient with binocular vision problems. Therefore, efforts should be made for early detection of non strabismic binocular anomalies as some of these may become strabismic even without causing symptoms. Strabismus which is more prevalent among children, have to be early detected and treated to prevent amblyopia. Proper treatment will positively impact their future and increase productivity of life.

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