

Effect of Anisometropic Correction on Binocularity at Al-Ibrahim Eye Hospital, Karachi

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Abstract

Introduction: Anisometropia is a condition in which the two eyes have unequal refractive power one eye may be markedly stronger than the other. Anisometropia affects our binocular vision. Individual with anisometropia typically see one eye larger image in one eye and one smaller image in the other eye.

Objective: To determine the effect of anisometropic correction on binocularity in Al-Ibrahim eye hospital, Malir Karachi.

Methods: A Cross Sectional Descriptive study was carried out in Al-Ibrahim eye hospital, Malir Karachi from July 2021 to December, 2021. Non-Probability Convenient sampling technique was used. This study involved 52 subjects who diagnosed with different types of Anisometropia of age range 10-30 years, of both genders. Demographic data, history of onset, visual acuity of every subject was checked and recorded separately both for near and distance, with and without glasses and with pin-hole, objective and subjective refraction were performed. Stereopsis was evaluated by Lang I, Lang II and Frisby test. Worth four dots test was also performed to evaluate the binocular single vision. SPSS version 20.0 was used to analyze the data.

Results: A total of 52 subjects were included in this study. Out of 52 subjects, 29 were males and 23 were females. Most of the subjects showed the degree of anisometropia of range (2.50 -3.00D). Astigmatism was most commonly presented in subjects among other refractive errors. Visual acuity was seen to be better after anisometropic correction showed significant result with p-value 0.000. There was slight change in stereo acuities with Lang I, Lang II and Frisby stereo acuity tests and all the subjects were indicated with normal fusional status by worth four dot test.

Conclusion: This study revealed that there was change in stereo acuities among all groups of degrees of anisometropia. There was no any association found between the age and degree of anisometropia on the Stereopsis and binocular single vision. Fusional status was normal showed the normal retinal correspondence.

Keywords: Anisometropia; Stereopsis; Lang I; Lang II; Frisby; Worth Four Dot Test

Introduction

Stereo vision is the relative sorting of visual objects in detail, or in the third dimension [1]. Stereo vision develops when horizon-

tally dissimilar retinal components are combined simultaneously [2]. Stereopsis is required for visuomanual coordination as well as delicate and precise activities [3]. It may be reduced in person with anisometropia by compromising with binocularity. In anisometro-

pia, there would be change in refractive of both eyes which may disrupts the binocular vision components [4]. Individual having normal binocular vision up to 5% difference in refractive power in eyes, but the difference of greater than 5% are more likely to develop problematic anisometropia [5]. Stereopsis is severely hampered if the strength is more than 3.0D, and particularly if the strength is greater than 6.0D. The higher the degree of anisometropia, the worsen the fusional status, and stereo vision abilities in subjects with earlier untreated anisometropia [6]. Previous studies have shown that the specific process by which anisometropia reduces stereo acuity is still unknown. It has been proposed that diminished Stereopsis is caused by foveal suppression in the defocused eye [7]. Stereopsis can be influenced by several factors which are related to clinical testing conditions such as illumination, color and contrast. Moreover, stereo acuity can be affected by refractive error, anisometropia and binocular anomalies such as strabismus amblyopia [8]. Some studies suggests that good visual acuity is not required for Stereopsis [9], while others reports showed that relatively low amounts of monocular blur severely reduce or eliminate Stereopsis [10]. Still some authors report that the retention of stereo acuity in clinically significant anisometropia [11].

Methods

A Cross Sectional, Descriptive study with Non Probability Convenient Sampling technique was used in this study. The duration of the study was from July 2021 to December 2021. A total of 52 subjects were studied at the pediatric, male and female department of Al-Ibrahim Eye Hospital, Malir Karachi. All the subjects were examined after obtaining a fully informed written consent. The protocol for examination for all subjects who were evaluated at the Department of pediatrics, male and female included the anterior segment examination with slit lamp to exclude any ocular disease. Demographic data, history of onset. Visual acuity of every subject was checked and recorded separately both for near and distance, with and without glasses and with pin-hole, objective and subjective refraction were performed. Stereopsis test were performed by Lang 1, Lang 2 and Frisby test. Worth Four Dot Test was also performed to assess the fusional status. The inclusion criterion of this study was subjects who had age from 05years to 30 years with anisometropia up to 6D were included. All type of refractive errors including Myopia, Hyperopia and Astigmatism. Whereas the exclusion criteria includes subjects who had anisometropia less than 2.5D with different ocular diseases, amblyopia and manifest strabismus induced by anisometropia.

Results

A total of 52 subjects were enrolled in this study. All the subjects were categorized into 4 groups. 20 subjects with 38.5% were in group 1 (10-15 years), followed by 15 subjects with 28.8% were in group 2 (16-20 years), 9 subjects with 17.3% were in group 3 (21-25 years) and 8 subjects with 15.4% were in group 4 (26-30 years). Out of 52 subjects, 29 subjects with 55.8% were males and 23 subjects with 44.2% were females. 39 (75%) subjects showed the degree of anisometropia of range (2.50 -3.00D), followed by 9 (17.3%) subjects had (3.5-4.00D), 4 (7.7%) subjects had (4.5-5.00D) and there was no any subjects of (5.5-6.00D) as shown in figure 1.

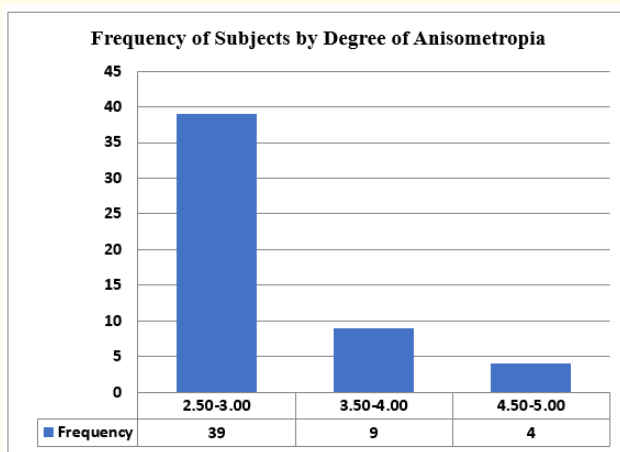


Figure 1: Frequency of Subjects by Degree of Anisometropia

The paired sample T test was applied to analyze the presenting visual acuity and anisometric corrected visual acuity of both right and left eye separately of about the p-value of 0.000. Most of the subjects had improved visual acuity after the acceptance of anisometric difference between two eyes, and there were very few subjects with high degree of anisometropia who had poor visual acuity. Visual acuity in right eye was improved in 84.6% of subjects visual acuity in left eye was improved in 96.2% of subjects. Astigmatism was most commonly presented in right eye among other refractive errors followed by myopia and hypermetropia with (55%, 28.8% and 11.5%) respectively whereas as astigmatism was also high in left eye among other refractive errors followed by myopia and hypermetropia with (61.5%, 23.1% and 15.4%).

Most of the subjects were found with (2.50-3.00D) degree of anisometropia in age group of (16-20 years). The chi-square test was applied to analyze the association between degree of anisometropia with different stereo acuity and BSV test (Lang I, Lang II, Frisby and Worth four dot test) which shows the non-significant values. Most of the subjects with (2.5-3.00D) degree of anisome-

tropia were tested with Lang I shown poor stereo acuity <550 sec of arc, Lang II showed poor stereo acuity 200 sec of arc and Frisby stereo test with poor stereo acuity of 340 sec of arc as shown in table 1, 2 and 3. Worth four dot test which showed that subjects who underwent the difference of even 2.5-6.00D of anisometropia had good fusion with normal retinal correspondence.

Degrees of Anisometropia * Lang I Cross tabulation					
Degrees of Anisometropia	Lang I				Total
	1200	600	550	Less than 550	
2.50-3.00 D	4	9	7	19	39
3.50-4.00 D	0	2	1	6	9
4.50-5.00 D	0	0	0	4	4
Total	4	11	8	29	52

Table 1: Cross tabulation of Degree of Anisometropia and Lang I.

Degrees of Anisometropia * Lang II Cross tabulation				
Degrees of Anisometropia	Lang II			Total
	600	400	200	
2.50-3.00 D	14	9	16	39
3.50-4.00 D	2	2	5	9
4.50-5.00 D	0	2	2	4
Total	16	13	23	52

Table 2: Cross tabulation of Degree of Anisometropia and Lang II.

Degrees of Anisometropia * Frisby Cross tabulation				
Degrees of Anisometropia	Frisby			Total
	340	170	85	
2.50-3.00 D	2	8	29	39
3.50-4.00 D	1	4	4	9
4.50-5.00 D	1	1	2	4
Total	4	13	35	52

Table 3: Cross tabulation of Degree of Anisometropia and Frisby.

Discussion

Anisometropia is an optical state with unequal refraction of the two eyes. The amount of spherical refractive error (myopia or hypermetropia) is usually about the same for both eyes in most of the people. Generally, anisometropia is considered to exist if the

refraction differs by 1.0 diopter (D) or more for the two eyes. The measuring unit for refractive error is diopter (D), which is defined as the reciprocal of the focal length in meters. Anisometropia is the most insidious refractive condition because it is often asymptomatic. The term antimetropia is used when one eye is myopic and the other is hypermetropic. The word anisometropia is derived from the Greek words anisos (unequal), metron (measure), and ops (vision) [12].

In this study, a total of 52 subjects were included with age ranges from 10 to 30 years. Out of 52 subjects, 55.8% were males and 44.2% were females. A previous study was conducted in Karachi (Pakistan) in 2017, that showed that the approximately same results as males were much affected than females (54.7% and 45.2%) respectively [13]. Another study was conducted in India in 2005, that showed males were more affected than females results found out 57.5% were males and 42.5% were females [14]. A study was conducted in Iran in 2012, that showed similar results were found out anisometropia in males and females were (48.44% and 51.56%) respectively [15]. Another study was conducted in Mashhad Iran in 2011, which showed that females were more affected than males [16].

All the anisometric subjects were categorized into myopic anisometropia, hyperopic anisometropia, astigmatism anisometropia, and antimetropia. Astigmatism anisometropia was most

common which was (55%), followed by myopic anisometropia which was (28.8%) and hyperopic anisometropia (11%). A previous study showed that myopic anisometropia (47.2%) was greater than astigmatism anisometropia (28.3%) and hyperopic anisometropia (10.2%) [17]. Another study showed the same results myopic anisometropia was greater than other refractive error [18].

The range of degree of anisometropia in this study was 2.50 to 6.00D with all forms of refractive errors. 39 (75%) subjects had anisometropia of 2.5 to 3D, followed by 9 (17.3%) subjects had 3.5 to 4.00D, 4 (7.7%) subjects had 4.5 to 5.00D. Another previous study was range of degree of anisometropia was (1.00-3.00D) [19].

In this study result showed that visual acuity in right eye was improved in (84.6%) of subjects and visual acuity in left eye was improved in 96.2% of subjects after correction, presenting visual acuity and anisometric corrected visual acuity of both right and left eye separately of about the p-value of (0.000). In previous study showed visual acuity was seen to be better after correction accepted by the subjects with P-value of (0.001) [20].

In this study stereopsis was measured by Lang I, Lang II and Frisby test. Most of the subjects with (2.5-3.00D) degree of anisometropia were tested with Lang I shown poor stereoacuity (<550 sec of arc), Lang II showed poor stereoacuity (200 sec of arc). In previous study showed that same results that stereo acuity of Lang I is reduced in more subjects who had perceived (<550 sec arc) than other refractive errors. Similar study showed same results in Lang II with more reduced stereoacuity in subjects who had perceived (200 sec arc) [21].

In our study results were found that Frisby stereotest with poor stereoacuity of (170 sec of arc). In another previous study result was showed that stereopsis was more affected in hypermetropic anisometropia subjects (170 sec arc) than myopia.

In this study result was showed that no changes in Binocular Single Vision and all 52 subjects presented with Normal Retinal Correspondence with Worth Four Dot test. A study was conducted in Turkey in 2001 result showed that 15 subjects fusion response were positive [22]. Another previous research showed that BSV with WFDT produced suppression [23]. In another study similar result was showed that Foveal suppression was evident on the Worth- Four-Dot test [24].

In this study Binocular single vision was found normal because we had added real anisometric subjects.

In some previous researches may be Suppression and Abnormal Retinal Correspondence was found because they were added normal subjects in their study and anisometropia was induced.

Conclusion

This study revealed that there were good stereo acuities in all groups of degrees of anisometropia. Frisby stereo test showed slight reduction in stereo acuities. There was no any association found between the age and degree of anisometropia on the stereopsis and binocular single vision. Fusional status was normal showed the normal retinal correspondence. The acceptance of anisometropia upto 6D was strong among all the subjects with better visual acuities.

Recommendations

- Timely screening in individual help practitioner to detect and manage anisometropia which prevents amblyopia.
- Eye care practitioners should consider binocularity test in subjects with anisometropia especially in school going age group.
- Further studies should be done to evaluate the BSV components in greater than 6D of anisometric different in subjects.

Limitations

- Only Frisby and Lang stereo test was used
- Anisometropia difference up to 6D was taken.

Conflict of Interest

There was no any conflict of interest between the authors.

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