ORIGINAL ARTICLE

Comparative Efficacy of Amblyopia Therapy in Different Types of Refractive Errors

SALAHUDIN ARBI, ZARTASHA MANZOOR, SIDRA QAMAR, *HAFIZ USMAN AKHTAR, SAJJAD MUHAMMAD HAIDER, RAZAULLAH KHAN*
[1]*Head of Ophthalmology Department, Sheikh Zayed Medical College and Hospital Rahim Yar Khan*
[2]*Optometrist, Janat Aziz Hospital Burewala*
[3]*Orthoptist, Sheikh Zayed Medical College and Hospital Rahim Yar Khan*
[4]*Assistant Professor, Sheikh Zayed Medical College and Hospital Rahim Yar Khan*
[5]*Assistant Professor, Sheikh Zayed Medical College and Hospital Rahim Yar Khan*
[6]Assistant Professor of Ophthalmology, Sheikh Zayed Medical College Rahim Yar Khan
Correspondence to Dr. Salahudin Arbi, *Email: saladinarbi@gmail.com*

ABSTRACT

Aim: To check the comparative efficacy of amblyopia therapy in different types of refractive errors.
Method: A comparative cross sectional study was done. Sample size was 40. Age ranges from (0-16) years. Females were (45%) and males were (57%). Visual acuity and pinhole visual acuity of both eyes was taken. Cycloplegic refraction of each patient was done by using streak retinoscopy to check refractive error objectively. Cyclopentolate was used to attain cycloplegia. BCVA was noted on subjective refraction on PMT and advised patching therapy with close near work for the management of amblyopia. Follow-up was done after 6 month to check the improvement in VA of amblyopic eye.Efficacy of therapy in different types of refractive error was compared. The study was conducted at college of ophthalmology and allied vision sciences, Mayo hospital Lahore, in the month of July to December 2014.
Results: Visual acuity improvement was 69.2% in hypermetropic, 64.3% in astigmatism, and 38.5% in myopia patching therapy. Visual acuity does not improve in 30.8% patients having hypermetropia, 35.7% in astigmatism and 61.5% in myopia after patching therapy.
Conclusion: It was concluded that patching therapy is more effective in case of hypermetropic amblyopia and astigmatism. Therapy remains less effective in myopic amblyopia.
Keywords: Amblyopia, refractive error, visual acuity

INTRODUCTION

Amblyopia is the reduction of visual acuity.It may be unilateral or may be bilateral. It has no relationship with abnormality in structure of eye. If amblyopia is treated in early years of life, it can give better results.[1]In early childhood due to binocular disruption, amblyopia result. In amblyopia there is disorder extend from primary visual cortex to extra-striate visual cortex which are involved in visual integration[2]. When an organic lesion is absent, a difference of two or more snellen lines indicates amblyopia. Visual acuity of amblyopic is usually better on single optotype than in linear reading of a row. Crowding phenomenon in amblyopic is more marked. It is very important when we are testing children of preverbal age.[3]

Amblyopia is common cause of unilateral blindness.The most common causes of amblyopia are strabismus, anisometropia and visual deprivation which may be as a result of congenital cataract and ptosis. Amblyopia occurs as a difference of two lines of visual acuity between the eyes[4].

Amblyopia is classified in the following groups as Strabismic, anisometropic, stimulus deprivation, bilateral ametropia and Meridional[5].Due to abnormal visual status in early life, visual cortex disorder which results in amblyopia. Amblyopia causes vision loss in infants and children of young age. In Strabismic amblyopia, streopsis affects more as compared to anisometropic amblyopia. The efficacy of treatment in Strabismic amblyopia is more than anisometropic amblyopia[6].

Amblyopia which is due to decreased visual input to one eye due to high refractive error of other eye is called as ametropic amblyopia. Amblyopia due to difference in refractive status of two eyes is called as anisometropic amblyopia. Strabismic amblyopia occurs due to disturbed binocular status of two eyes[7]. In Anisometropic amblyopia the increasing in difference of spherical equivalent and cylindrical axis difference are rising as a risk of amblyopia. As high the refractive error increases, the risk of anisometropia also increases[8]. Family history of amblyopia is at greater risk of greater chances of amblyopia Strabismus and refractive error are closely associated to each other. In development of amblyopia these factors play a very important role[9]. Abnormality of refractive error causes amblyopia[10].

The assessment of visual acuity should be accurate in order to assess the detection of amblyopia.[11] Amblyopia is an ideal model to understand how plasticity of brain may be harnessed. It is necessary to investigated the measurement of binocular single vision in patients of Strabismic, anisometropic and amblyopia of mixed type[12].

It is very important in treatment of amblyopia to regain binocular single vision. In amblyopia treatment it is important to measure the extent to which amblyopic eye suppresses the normal eye. Improvement in Strabismic amblyopia occur with reduction of suppression[13]. On the basis of geometrical optics, visual acuity at both distance and near would be same.In amblyopic eyes near vision is reduced than distance with reduced accommodation[14]. The

Received on 24-04-2019
Accepted on 14-10-2019

most important risk factors for unilateral amblyopia are strabismus and high refractive error. For the development of bilateral amblyopia important risk factors are bilateral astigmatism and hypermetropia of bilateral type[15].

With increasing severity of amblyopia, the ability to resolve high frequency decrease, and contrast sensitivity of amblyopic eye also decreases.There may be low processing of Parvocellular and Magnocellular pathway[16]. Accommodative performance of amblyopic eye should always be measured. Modified Nott Retinoscopy was used to measure the accommodative effort[17].

A common cause of loss of preventable vision is amblyopia. Different treatment options have been recommended with different duration and efficacy. Key of success in amblyopia therapy is compliance. Time of treatment is mostly 6-12 months. However it is necessary to undergo follow up after treatment in order to check the regression of amblyopia[18].

Amblyopia affects 1.3%-3.6% of children. Treatments are available in order to reduce the visual acuity defects. But in most of amblyopic individual visual acuity remains effective and risk of recurrences of amblyopia also present. It has been studies that binocular dysfunction causes amblyopia[19].

Amblyopia is confirmed by cycloplegic refraction, complete measurement of visual acuity and full orthoptic assessment. In younger age treatment is more effective. Cooperation of child is required to make treatment successful. Treatment based on occlusion or penalization[20]

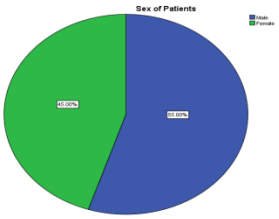
Partial occlusion strategies lacks clinical experiments during treatment of amblyopia of visual deprivation type[21]. The best results found in Strabismic amblyopia[22]. In diagnosis of amblyopia fixation preference test is used to check either there is no fixation preference or there is very strong fixation[23].

MATERIALS & METHODOLOGY

Before the start of research a pre-research planning was done in which all the aspects were looked. It included selection of research site, target population, sample size, self-designed Performa, sampling method, research methodology, organizational issues, pilot study and work plan. A comparative cross sectional study was conducted. Sample size was 40 patients having amblyopia, calculated by non-probability convenient method. Age limit was (0-16). Male and females both were included. Equal distribution of patients having different type of refractive errors i-e myopia, hypermetropia and astigmatism was done. Visual acuity and pinhole visual acuity of both eyes was taken. Cycloplegic refraction of each patient was done by using streak retinoscopy to check refractive error objectively. Cyclopentolate was used to attain cycloplegia. Subjective refraction was done on PMT after three days. BCVA was noted and advised patching therapy with close near work for the management of amblyopia. Patients are advised for follow up after 6 months. On follow up VA was again tested to check the improvement in VA of amblyopic eye.Efficacy of therapy in different types of refractive error was compared. Study was conducted at college of ophthalmology and allied vision sciences at opd of mayo hospital Lahore. All records were crossed checked, record file was carefully prepared for entering data using SPSS 13.0 software. To avoid entry bias, double entries were done in different computers. All data was cleaned and analyzed.

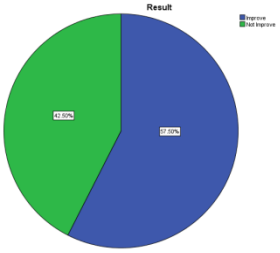
RESULTS

Graph 1



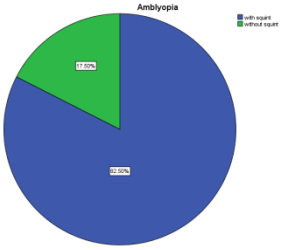
This chart shows thatpie chart showing that no of males is 55% including in study are more as compared to females 45%.

Graph 2



This pie chart shows that improvement of visual acuity is 57% more than not improved 43%.

Graph 3



This pie chart shows thatwith squint amblyopia is 82.5% more common as compared to without squint 17.5%.

Table 1:

VisualAcuity of Right Eye					
		Frequency of VA of left eye	%age	Valid Percent	Cumulative Percent of VA of right eye
Valid	6/6-6/18	16	40.0	40.0	40.0
	6/18-6/36	12	30.0	30.0	70.0
	6/36-6/60	12	30.0	30.0	100.0
	Total	40	100.0	100.0	

This table showing that visual acuity of right eye 40% lying in range 6/6-6/18, 30% lying in range b/w 6/18-6/36 and 30% lying b/w 6/36-6/60.

Table 2:

Visual Acuity of Left Eye					
		Frequency of VA of left eye	Percent	Valid Percent	Cumulative Percent of VA of left eye
Valid	6/6-6/18	16	40.0	40.0	40.0
	6/18-6/36	16	40.0	40.0	80.0
	6/36-6/60	8	20.0	20.0	100.0
	Total	40	100.0	100.0	

Tthis table shows that visual acuity of right eye 40% lying in range 6/6-6/18, 40% lying in range b/w 6/18-6/36 and 20% lying b/w 6/36-6/60**.**

Table 3:

Pinhole VAR Eye					
		Frequency of PHVAR	Percent	Valid Percent	Cumulative Percent of PHVAR
Valid	6/6-6/18	16	40.0	40.0	40.0
	6/18-6/36	12	30.0	30.0	70.0
	6/36-6/60	12	30.0	30.0	100.0
	Total	40	100.0	100.0	

This shows that pinhole visual acuity of right eye 40% lying in range 6/6-6/18, 30% lying in range b/w 6/18-6/36 & 30% lying b/w 6/36-6/60.

Table 4:

Pinhole VAL Eye					
		Frequency Percent of PHVAR	Percent	Valid Percent	Cumulative Percent of PHVAR
Valid	6/6-6/18	17	42.5	42.5	42.5
	6/18-6/36	15	37.5	37.5	80.0
	6/36-6/60	8	20.0	20.0	100.0
	Total	40	100.0	100.0	

This table showing that pin hole visual acuity of right eye 42.5% lying in range 6/6-6/18, 37.5% lying in range b/w 6/18-6/36 and 20% lying b/w 6/36-6/60.

Table 5

VA Spectacles of Right Eye					
		Frequency of VASR	Percent	Valid Percent	Cumulative Percent of VASR
Valid	6/6-6/18	16	40.0	40.0	40.0
	6/18-6/36	12	30.0	30.0	70.0
	6/36-6/60	12	30.0	30.0	100.0
	Total	40	100.0	100.0	

This table showing that visual acuity with spectacle of right eye 40% lying in range 6/6-6/18, 30% lying in range b/w 6/18-6/36 and 30% lying b/w 6/36-6/60.

Table 6**:**

VA Spectacles of Left Eye					
		Frequency OF VASL	Percent	Valid Percent	Cumulative Percent of VASL
Valid	6/6-6/18	17	42.5	42.5	42.5
	6/18-6/36	15	37.5	37.5	80.0
	6/36-6/60	8	20.0	20.0	100.0
	Total	40	100.0	100.0	

This table showing that visual acuity with spectacles of right eye 42.5% lying in range 6/6-6/18, 37.5% lying in range b/w 6/18-6/36 and 20% lying b/w 6/36-6/60.

Table 7:

Best Corrected VA of Right Eye					
		Frequency BCVAR	Percent	Valid Percent	Cumulative Percent of BCVAR
Valid	6/6-6/18	16	40.0	40.0	40.0
	6/18-6/36	12	30.0	30.0	70.0
	6/36-6/60	12	30.0	30.0	100.0
	Total	40	100.0	100.0	

This table show that best corrected visual acuity of right eye 40% lying in range 6/6-6/18, 30% lying in range b/w 6/18-6/36 and 30% lying b/w 6/36-6/60.

Table 8:

Best Corrected VA of Left Eye					
		Frequency of BCVAL	Percent	Valid Percent	Cumulative Percent OF BCVAL
Valid	6/6-6/18	17	42.5	42.5	42.5
	6/18-6/36	15	37.5	37.5	80.0
	6/36-6/60	8	20.0	20.0	100.0
	Total	40	100.0	100.0	

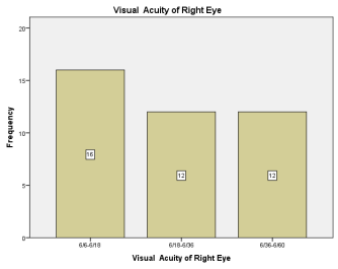
This table show that visual acuity of left eye 42.5% lying in range 6/6-6/18, 37.5% lying in range b/w 6/18-6/36 and 20% lying b/w 6/36-6/60.

Table 9:

Refractive Error					
		Frequency of refractive error	Percent	Valid %t	Cumulative Percent of refractive error
Valid	Hypermetropia	13	32.5	32.5	32.5
	Myopia	13	32.5	32.5	65.0
	Astigmatism	14	35.0	35.0	100.0
	Total	40	100.0	100.0	

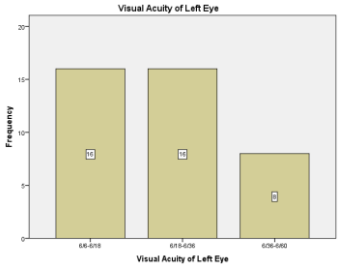
This table showing thedifferent type of refractive error 32.5% hypermetropia,32.5% myopia and 35% astigmatism**.**

Graph 1



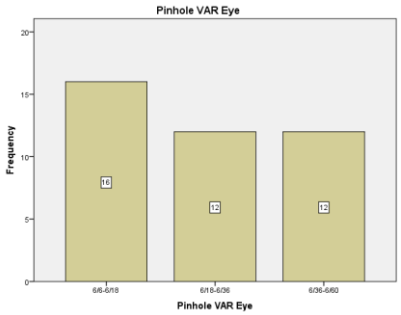
This graph shows the frequency of visual acuity of right eye. frequency was highest in VA between 6/6-6/18.

Graph 2



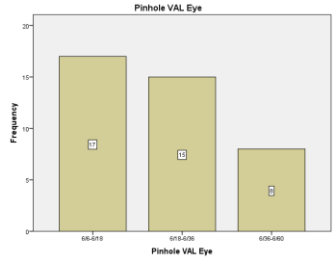
This graph shows the frequency of visual acuity of left eye was least in 6/36-6/60.

Graph 3



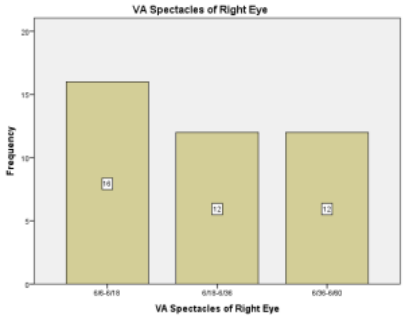
This graph shows the frequency of pinhole visual acuity of right eye is high in VA ranges from 6/36-6/60.

Graph 4



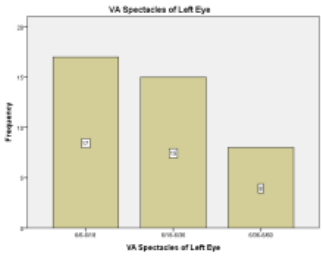
This graph shows the frequency of pinhole visual acuity of left eye is highest in 6/6-6/18.

Graph 5



This graph shows the frequency of spectacle corrected visual acuity of right eye is highest in 6/6-6/18.

Graph.6

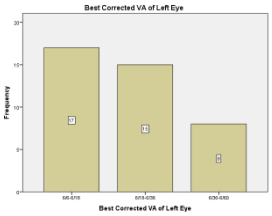


This graph shows the frequency of spectacle corrected visual acuity of left eye is highest in 6/6-6/18.

Graph.7

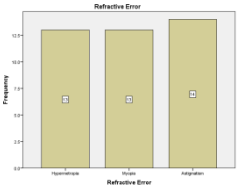
Thisgraph shows the frequency of best corrected visual acuity of right eye is eye is highest in 6/6-6/18.

Graph 8



This graph shows the frequency of best corrected visual acuity of left eye is eye is highest in 6/6-6/18.

Graph.9



This graph shows the frequency of different refractive error which is almost equal.

Result * Refractive Error Cross tabulation						
			Refractive Error			Total
			Hypermetropia	Myopia	Astigmatism	
Result	Improve	Count	9	5	9	23
		% within Refractive Error	69.2%	38.5%	64.3%	57.5%
	Not Improve	Count	4	8	5	17
		% within Refractive Error	30.8%	61.5%	35.7%	42.5%
Total		Count	13	13	14	40
		% within Refractive Error	100.0%	100.0%	100.0%	100.0%

This table shows result of efficacy of patching therapy in different refractive error. In Hypermetropia improvement is 69.2%, myopia38.5% and astigmatism 64.3%.

Result * Refractive Error Cross tabulation					
Count					
		Refractive Error			Total
		Hypermetropia	Myopia	Astigmatism	
Result	Improve	9	5	9	23
	Not Improve	4	8	5	17
Total		13	13	14	40

This shows result of efficacy of patching therapy in different refractive error. In Hypermetropia improvement was in 9 pts, myopia 5 pts and astigmatism 9 pts.

DISCUSSION

All of above discussion proves that in Hypermetropia and astigmatism patching therapy gives more effective results as compared to myopia because visual acuity in mostly patients improves. In hypermetropia visual acuity improvement was 69.2%, in astigmatism 64.3% and in myopia 38.5%.It shows that improvement of visual acuity in myopia is very not very good. However, treatment was very effective in case of Hypermetropia and astigmatism, allowing visual system to recover binocular single vision and streopsis and vision regain to maximum level. In both of these refractive errors hypermetropia and astigmatism visual acuity improves and visual comfort also increases. But it was more effective in hypermetropia as compared to astigmatism. However, in myopia visual acuity does not improve too much greater extent, and hence no effect on binocular single vision, vision and streopsis.

CONCLUSION

In this study data was analyzed using chi-square method. It gives results as improvement was 69.2% in hypermetropia, 64.3% in astigmatism which is much more effective and 38.6% in myopia which is no more effective to a greater extent.

REFRENCES

1. DeSantis D. Amblyopia. Pediatr Clin North Am. 2014;61(3):505-18.
2. Hamm LM, Black J, Dai S, Thompson B. Global processing in amblyopia: a review. Front Psychol. 2014;5(583)
3. Kanski JJaBBCOES, 2011 . amblyopia. 2011.
4. Pescosolido N, Stefanucci A, Buomprisco G, Fazio S. Amblyopia treatment strategies and new drug therapies. J Pediatr Ophthalmol Strabismus. 2014;51(2):78-86.
5. Menon V, Chaudhuri Z, Saxena R, Gill K, Sachdeva M. Classification of amblyopia. Indian journal of ophthalmology. 2006;54(3):212.
6. Levi DM, Knill DC, Bavelier D. Stereopsis and Amblyopia: A Mini-Review: Vision Res. 2015 Jan 28. pii: S0042-6989(15)00008-5. doi: 10.1016/j.visres.2015.01.002.
7. Ganekal S, Jhanji V, Liang Y, Dorairaj S. Prevalence and etiology of amblyopia in Southern India: rsults from screening of school children aged 5-15 years. Ophthalmic epidemiology. 2013;20(4):228-31
8. Afsari S, Rose KA, Gole GA, Philip K, Leone JF, French A, et al. Prevalence of anisometropia and its association with refractive error and amblyopia in preschool children. The British journal of ophthalmology. 2013;97(9):1095-9.
9. Chia A, Lin X, Dirani M, Gazzard G, Ramamurthy D, Quah BL, et al. Risk factors for strabismus and amblyopia in young Singapore Chinese children. Ophthalmic epidemiology. 2013;20(3):138-47.
10. Fu J, Li SM, Li SY, Li JL, Li H, Zhu BD, et al. Prevalence, causes and associations of amblyopia in year 1 students in Central China : The Anyang childhood eye study (ACES). Graefe's archive for clinical and experimental ophthalmology = Albrecht von Graefes Archiv fur klinische und experimentelle Ophthalmologie. 2014;252(1):137-43.
11. Formankiewicz MA, Waugh SJ. The effects of blur and eccentric viewing on adult acuity for pediatric tests: implications for amblyopia detection. Investigative ophthalmology & visual science. 2013;54(10):6934-43.
12. Hess RF, Thompson B, Baker DH. Binocular vision in amblyopia: structure, suppression and plasticity. Ophthalmic & physiological optics : the journal of the British College of Ophthalmic Opticians. 2014;34(2):146-62.
13. Hess RF, Mansouri B, Thompson B. Restoration of binocular vision in amblyopia. Strabismus. 2011;19(3):110-8.
14. Catford GV. Amblyopia: a comparison between distance and near vision. Br J Ophthalmol. 1956;40(10):633-5.
15. Pascual M, Huang J, Maguire MG, Kulp MT, Quinn GE, Ciner E, et al. Risk factors for amblyopia in the vision in preschoolers study. Ophthalmology. 2014;121(3):622-9.
16. Song FW, Sun ZH, Yang Y, Wang LP, Tang XJ, Chen BB, et al. [Mechanism underlying spatial vision deficit of monocular amblyopia based on the theory of Magnocellular and Parvocellular (M-P) pathways]. Zhejiang Da Xue Xue Bao Yi Xue Ban. 2014;43(1):101-8.
1. 17.. Manh V, Chen AM, Tarczy-Hornoch K, Cotter SA, Candy TR. Accommodative Performance of Children with Unilateral Amblyopia. Investigative ophthalmology & visual science. 2015.
17. Gunton KB. Advances in amblyopia: what have we learned from PEDIG trials? Pediatrics. 20 13;131(3):540-7.
18. Birch EE. Amblyopia and binocular vision. Progress in retinal and eye research. 2013;33:67-84.
19. Orssaud C. [Amblyopia.]. Journal francais d'ophtalmologie. 2014;37(6):486-96.
20. Vasconcelos GC, Costa MF. Current treatment of amblyopia: where are we? Arquivos brasileiros de oftalmologia. 2013;76(4):VII-VIII.
21. Canadanovic V, Bjelica D, Babovic S, Bedov T, Babic N, Grkovic D. Detection and treatment of amblyopia in children. Medicinski pregled. 2011;64(1-2):73-6.
22. Procianoy L, Procianoy E. The accuracy of binocular fixation preference for the diagnosis of strabismic amblyopia. Journal of AAPOS : the official publication of the American Association for Pediatric Ophthalmology and Strabismus / American Association for Pediatric Ophthalmology and Strabismus. 2010;14(3):205-10.