

Evaluation of New Method in Treatment of Amblyopia between Adults and Children

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Abstract

Amblyopia (lazy eye) is a condition of cortical visual impairment, clinically occurs as a unilateral or bilateral decrease of visual acuity (VA). Since the age of patients directly influence in the treatment of amblyopia. This study sought to evaluate the effectiveness of stimulator device in amblyopia treatment for children and adults in total 38 patients using stimulator at least one times weekly with follow up reached to 4 months. There was a significance differences in VA improvement using stimulator at ($P > 0.05$), as well as there was a significance differences between two age group (younger age less than 13 years and older age more than 13 years) at ($P > 0.05$) that improvement increased in younger aged, Usage of vit. A tab during course of treatment enhance and accelerate the improvement of VA.

Key-word: Amblyopia, Visual Acuity, Stimulator, Tropia.

1. Introduction

Amblyopia (lazy eye) is a condition of cortical visual impairment, clinically occurs as a unilateral or bilateral decrease of visual acuity (VA), considered reversible visual loss arising from an insult to the developing visual system in early life common cause of visual loss (blindness) in children, affecting 2 - 3% of population blindness, and is considered as one of the most common causes of persistent unilateral visual impairment in adulthood (1,6). It is considered as a neurodevelopmental disorder of the visual system caused by abnormal binocular vision experience in early childhood (5). Several passive and active methods to treat amblyopia, occlusion of the dominant eye and forced use of the amblyopic eye is the most common method and the best treatment other methods including Treat any organic disease cataract or else, optical correction for refractive error or phormological treatment by cycloplegic in child age group (7). In Bilateral amblyopia encourage

visual tasks that need simultaneous use of both eyes, electronic device can serve for this purpose (4, 8). Age should be taken in consideration in treatment which directly affects the outcomes, formally children reach the age 7 years improvement rate of visual acuity becomes very slow and compliance with wearing a patch often becomes a major problem, while in older ages, occlusion method could be effective if done correctly, but it is hard work and needs motivation (3).

2. Methods

Study Participants and Ethics Statement

A retrospective study includes 38 patients with amblyopia in different age groups and different refractive error subjected to (simulator) Sessions to improve visual acuity and so life style quality. A simulator used at least once weekly with closing one eye respectively. V.A was recorded before and after using simulator in two situation with glasses and without glasses.

Exclusion Criteria

In final results, the escaped patients were excluded from recommendation and conclusion.

Statistical Analysis

All data were expressed as mean \pm SD and analyzed using SPSS 18.0 software (SPSS Inc., Chicago, IL). Differences between groups were assessed using Student's paired sample t-test and independent t-test.

3. Results

Patients Demography

Retrospective study included 38 patients from both gender male 22/38 (58%) and female 16/38 (42%), age ranged (5–34) median age 13, Counting finger (C.f) is the most common initial VA in study samples which mean poor vision V.A for these patients less than 6/60, all patients using glass either with spher lenses, toric lenses or both and 37% of them with tropia either esotropia or exotropia, Hyperopia is the commonest refractive error in amblyopic patients and esotropia is the

comments type of squint in amblyopic patients. There was a good percentage of arthotropia in amblyopic patient (40% of all patient), figure (1), table (1).

Figure 1 - Percentage of Patients with Tropia

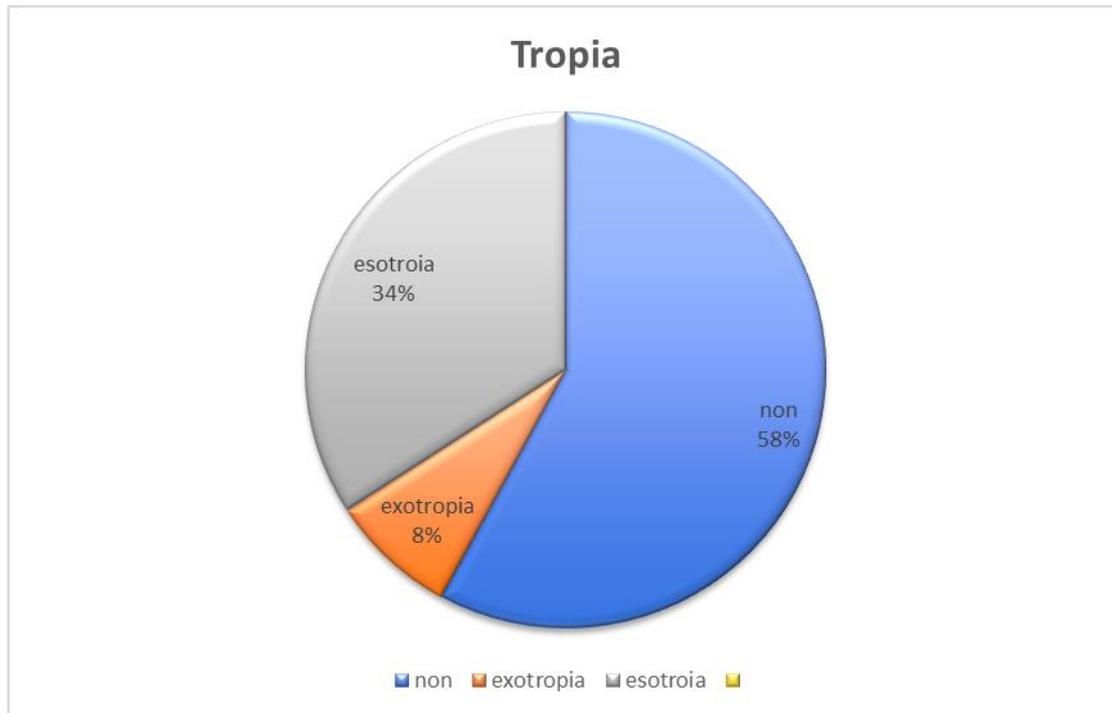


Table 1

No	gender	age	tropia	glasses	closure	Pre		post		Time
						Unaided eyes	Aided eyes	Unaided eyes	Aided eyes	
1	Female	13y	No	-2.75DC	4hr	R 6/18	6/18	6/18	6/6	2/w over 3mns
2	Male	13	eso.	+2.5 DS	-	R <6/60	6/60	6/36	6/18	2/w -3m
3	Female	7	eso.	R+3.75 DS L +7 DS	6hr	L <6/60	6/60	6/24	6/18	2/w-3m
4	Male	24	No	(L) +2.00	6hr	L <6/60	6/36	6/36	6/18	1/w-6 w
5	Male	9y	eso.	+5.00 DS +6.00 DS	2hr each	L 6/60	6.24	6/24	6/12p	2/w- 3m
6	Female	13y	No	R-1.75 DC	3hr	6/36	6/12	6/9	6/6p	over 3 w
7	Male	12y	eso.	+4 DS +3.25DS	2hr	R <6/60 L 6/60	6.18 6/20	6/60 6/36	6/18 6/20	2/w- 2m
8	Male	12y	Eso	R+2.00Ds L+2.25Ds	2hr	R 6/60 L 6/36	6/12p 6/12p	R 6/18 L 6/12	6/12 6/6	2/w - 12w
9	Male	6	Eso	(L) +2.00 DS	4hr	6.18	6.18	6/9	6/6p	2/w -1m
10	Male	10	NO	L +1.75S/-1 DC		L < 6/60	6/60	6/18	6/12p	2/w -2m
11	Male	5y	NO	R+3.25 L+3.5 DS	3hr each	R 6/24 L 6/24	6/18p 6/12	6/9 6/9	6/9 6/9	2/w-3m

12	Male	11Y	Eso	R + 1 DS/-3 DC	6hr	R < 6/60	6/18p	6/24	6/9	2/w -3m
13	Female	14Y	Eso	+2S/-0.5DC	6hr	L 6/60	6/60	6/24	6/9p	2/w -3m
14	Female	17Y	ESO	R +3DC L +2.5DC	2hr for each	R < 6/60 L < 6/60	6/36 6/24	6/24 6/18	6/9 6/9	1/w -4m
15	Male	8Y	NO	L -1.25DS		L 6/12	6/9	6/9	6/6	1/w -4w
16	Male	12	Exo	-2.00 DS Both eyes	2hr for each	R < 6/60 L < 6/60	6/60 6/24	< 6/60 < 6/60	6/18 6/6	1/w -6w
17	Female	15y	No	-	6hr	R < 6/60	6/60	6/60	6/12	1/w -5m
18	Male	23y	No	R -3.00 DS	NO	R < 6/60	6/60	< 6/60	6/12	1/w -6w
19	Male	26	No	L +2.00 DS	NO	< 6/60	< 6/60	< 6/60	6/24	1/2 w -3m
20	Female	18	ESO	R+1.75DS		< 6/60	< 6/60	< 6/60	6/36	1/w-1m
21	Female	15	Exo	R -0.75	3hr	R 6/24	6/18	6/18	6/9	1/w -3m
22	Male	12y	No	-12 DS Both eyes	-	R < 6/60 L < 6/60	< 6/60 < 6/60	< 6/60 < 6/60	6/12 6/24	1/w-2m
23	Male	15y	No	L +2.00 DS	6h	L < 6/60	< 6/60	< 6/60	6/36	1/w-2m
24	Male	10y	No	+2/-2.5 Both eyes	2hr for each	R < 6/60 L < 6/60	6/36 6/24	6/18p 6/24	6/12 6/18	1/w-2m
25	Male	15Y	EXO BOTH	-1.5 DS/1.5DC Both eyes	2hr for each	R < 6/60 L < 6/60	6/18 6/24	< 6/60 < 6/60	6/9 6/9	1/w-6w
26	Female	12Y	NO	L+2 DS	-	L 6/36	6/24	6/36	6/18	1/w-1m
27	Male	17y	NO	+2.00 Ds	6hr	< 6/60	< 6/60	< 6/60	6/24	8w
28	Male	29y	NO	R-2.25C	-	R 6/18	6/18	6/18	6/6p	1/w-4w
29	Female	10	No	L+1.51/-2.5DS	6hr	L < 6/60	< 6/60	L 6/60	6/6	1/w -6w
30	Male	25y	No	L +2.00 Ds	No	L < 6/60	< 6/60	6/60	6/6	Over 2m
31	Female	10y	Eso	R +1.75/-1.25DS	3hr	R 6/60	6/12	6/6	6/6	1/w-6w
32	Male	23y	No	R-3 DC	3hr	R 6.36	6/18	6/24	6/6 p	1/w-4w
33	Female	13y	NO	R 0.5/-1.00 L -1.00 DC	3hr	L 6/60	6/24	6/60	6.12p	2/w-2m
34	Female	12y	ESO	L -1.5/-2.5 DS	3hr	L < 6/60	6/12	6/9	6/9	2/w-3m
35	Male	9Y	No	R+1/-1.75DS	1hr	R 6/18	6/9	6/12	6/6p	2/w
36	Female	15y	No	R-9/-1.5 DS L -8.00 Ds	2hr for each	R < 6/60 L < 6/60	6/36 6/18	< 6/60 < 6/60	6/24 6/18	1/w -6 w
37	Female	23	No	R +2.5DS	6hr	< 6/60	< 6/60	< 6/60	6/36	1/w-2m
38	Female	34	No	L+2.5 DS	-	L.6/24	6/24	6/9	6/9	2M

R: right eye, L: left eye, w: week, m: month, hr: hours, DS: spher lenses, DC: toric lenses.

In this study there was a significance differences in VA improvement before and after using stimulator at ($P > 0.05$), with improvement percentage 100% for all patients in both male and female in different ages but improvement increased in younger aged due to present a significance differences between two age group (younger age less than 13 years and older age more than 13 years) at ($P > 0.05$), final result ranges from (6/60 – 6/24) without glasses improvement from poor vision to moderate visual impairment and (6/18 – 6/6) with glasses improvement from moderate visual impairment to near-normal vision or normal vision. Older age group who a chief 6/6 undergo lasik

and keep 6/6 without glasses. Some regression can occur months after cessation of simulator + closure so, it's good to keep regular follow up 3months after completion of treatment especially in younger patient till age of stabilization of refractive error and vision. There were more than 30 patients out of our recommendation and conclusion because they escape in first 2 session, escaped patient usually with denser amblyopia who didn't achieve mentioned improvement is 1st sessions and usually from far living area.

4. Discussion

Amblyopia this type of dysfunction in eyes is the chief cause of preventable children blindness, with an incidence between 1 and 5% and it is still considered one of the main causes of unilateral visual impairment that persists in the adulthood, time of diagnosis of amblyopia usually at Teenage group school screening crucial for helping in well diagnose some cases. In this study first time reported in Iraq to improvement of VA in age group more than 12 years.

A study in Texas (2015) to determine whether repeated binocular visual experience with dichoptic iPad games could effectively treat amblyopia in preschool children, included 50 child age ranged between 3-6.9 years, they concluded that repeated binocular experience, provided by dichoptic iPad game play, was more effective than sham iPad game play as a treatment for amblyopia in preschool children (2). A study in Iran in 2019 included 68 patients to evaluate the effectiveness of CAM visual stimulation in amblyopia treatment for 7 - 20 years old patients, their results indicated that visual acuity was increased, and patients older than 7 years old have good chance to achieve successful treatment of amblyopia by this method. CAM visual stimulation could be suggested to patients with severe amblyopia (3). Many studies focused in improve VA in patients with amblyopia with by training eyes with different approaches including monocular training, included making tasks while the dominant eye is occluded, monocular videogames viewing, dichoptic therapy, perceptual learning using anaglyphs, lenticular screen, virtual reality, polarized lens, stereoscopes and other types of mechanisms used to improve binocular vision (e.g., , liquid crystal shutter glasses and video stereo-goggles) all these technique were improve and enhance VA (9-28).

5. Conclusion

Simulator can improve the VA un ambylopia especially in younger people (Teenage) especially with usage of vit. A tab. or syrup, occlusion therapy and glasses all together. to keep

regular follow-up after completion of treatment. School screening test for VA is helpful in diagnosis of amblyopia

References

- Papageorgiou E, Asproudis I, Maconachie G, Tsironi EE, Gottlob I. The treatment of amblyopia: current practice and emerging trends. *Graefes Arch Clin Exp Ophthalmol*. 2019 Jun; 257(6): 1061-1078.
- Birch EE, Li SL, Jost RM, Morale SE, De La Cruz A, Stager D Jr, Dao L, Stager DR Sr. Binocular iPad treatment for amblyopia in preschool children. *J AAPOS*. 2015 Feb; 19(1):6-11.
- Masoumeh Ahadi., Haleh Kangari², Farideh Moradi-khah³, Ali Akbar Saber moghaddam⁴ and Alireza Akbarzadeh Baghban “Therapeutic Effects of CAM Visual Stimulation in 7 - 20 Years Old Patients with Amblyopia”. *Acta Scientific Ophthalmology* 2.9 (2019): 11-16.
- Suttle CM. Active treatments for amblyopia: a review of the methods and evidence base. *Clin Exp Optom*. 2010 Sep; 93(5): 287-99.
- Rodán, A., Marroquín, E. and C. Jara, L. An updated review about perceptual learning as a treatment for amblyopia. *J Optom*. 2020, 8(2): 1-35.
- Hakim OM, Gaber El-Hag Y, Samir A. Silicone-eyelid closure to improve vision in deeply amblyopic eyes. *J Pediatr Ophthalmol Strabismus*. 2010 47(3): 157-62.
- Kraus CL, Culican SM. New advances in amblyopia therapy II: refractive therapies. *Br J Ophthalmol*. 2018; 102(12):1611-1614.
- Wallace DK, Chandler DL, Beck RW, Arnold RW, Bacal DA, Birch EE, Felius J, Frazier M, Holmes JM, Hoover D, Klimek DA, Lorenzana I, Quinn GE, Repka MX, Suh DW, Tamkins S; Pediatric Eye Disease Investigator Group. Treatment of bilateral refractive amblyopia in children three to less than 10 years of age. *Am J Ophthalmol*. 144(4): 487-96.
- Vedamurthy I, Knill DC, Huang SJ, et al. Recovering stereovision by squashing virtual bugs in a virtual reality environment. *Philos Trans R Soc Lond B Biol Sci*. 2016; 371(1697): 20150264.
- Barollo M, Contemori G, Battaglini L, Pavan A, Casco C. Per-ceptual learning improves contrast sensitivity, visual acuity, and foveal crowding in amblyopia. *Restor Neurol Neurosci*. 2017; 35(5): 483-496.
- Bossi M, Tailor VK, Anderson EJ. Binocular therapy for childhood amblyopia improves vision without breaking interocular suppression. *Invest Ophthalmol Vis Sci*. 2017; 58: 3031-3043.
- Singh A, Sharma P, Saxena R. Evaluation of the role of monocular video game play as an adjuvant to occlusion therapy in the management of anisometropic amblyopia. *J Pediatr Ophthalmol Strabismus*. 2017; 54(4): 244-249.
- Ziak P, Holm A, Haličková J, Mojžiš P, Piňero DP. Amblyopia treatment of adults with dichoptic training using the virtual reality oculus rift head mounted display: Preliminary results. *BMC Ophthalmol*. 2017;17(1):1-8.
- Gambacorta C, Nahum M, Vedamurthy I, et al. An action video game for the treatment of amblyopia in children: A feasibility study. *Vision Res*. 2018; 148: 1-14.

- Gao TY, Guo CX, Babu RJ, et al. Effectiveness of a binocular video game vs placebo video game for improving visual functions in older children, teenagers, and adults with amblyopia: A randomized clinical trial. *JAMA Ophthalmol*. 2018; 136(2): 172-181.
- Jia W, Lan F, Zhao X, et al. The effects of monocular training on binocular functions in anisometropic amblyopia. *Vision Res*. 2018; 152: 74-83.
- Kelly KR, Jost RM, Wang Y-Z, et al. Improved binocular outcomes following binocular treatment for childhood amblyopia. *Invest Ophthalmol Vis Sci*. 2018; 59: 1221-1228.
- Liu XY, Zhang JY. Dichoptic training in adults with amblyopia: Additional stereoacuity gains over monocular training. *Vision Res*. 2018; 152: 84-90.
- Manh VM, Holmes JM, Lazar EL, et al. Pediatric Eye Disease Investigator Group. A randomized trial of a binocular iPadgame versus part-time patching in children aged 13 to 16years with amblyopia. *Am J Ophthalmol*. 2018; 186: 104-115
- Mezad-Koursh D, Rosenblatt A, Newman H, Stolovitch C. Homeuse of binocular dichoptic video content device for treatment of amblyopia: A pilot study. *J AAPOS*. 2018;22(2):134-138
- Moret B, Camilleri R, Pavan A, et al. Differential effects of high-frequency transcranial random noise stimulation (hf-tRNS) on contrast sensitivity and visual acuity when combined with a short perceptual training in adults with amblyopia. *Neuropsychologia*. 2018; 114: 125-133
- Portela-Camino JA, Martín-González S, Ruiz-Alcocer J, Illarramendi Mendicute I, Garrido-Mercado R. A random dot computer video game improves stereopsis. *Optom Vis Sci*. 2018; 95(6): 523-535.
- Holmes JM, Manny RE, Lazar EL, et al. A randomized trial of binocular dig rush game treatment for amblyopia in children aged 7 to 12 years. *Ophthalmology*. 2019;126(3): 456-466.
- Law CL, Backus BT. Use of a new compo-site index to demonstrate improved stereoacuity after training on stimuli with dichoptically asymmetric contrast. *Vision Res*. 2019; 171: 73-83.
- Liu XY, Zhang JY. Dichoptic de-masking learning in adults with amblyopia and its mechanisms. *Invest Ophthalmol Vis Sci*. 2019; 60: 2968-2977.
- Sauvan L, Stolowy N, Denis D, et al. Contribution of short-time occlusion of the amblyopic eye to a passive dichoptic video treatment for amblyopia beyond the critical period. *Neural Plast*. 2019:6208414
- Birch EE, Jost RM, Kelly KR, Leffler JN, Dao L, Beauchamp CL. Baseline and clinical factors associated with response to amblyopia treatment in a randomized clinical trial. *Optom Vis Sci*. 2020; 97(5): 316-323.
- Gu L, Deng S, Feng L. Effects of monocular perceptual learning on binocular visual processing in adolescent and adult amblyopia. *I science*. 2020; 23(2): 100875.