New Strategy in the Management of Amblyopia.

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Abstract

Amblyopia is a condition involving reduced acuity caused by abnormal visual input during a critical period beginning shortly after birth. Amblyopia is typically considered to be irreversible during adulthood. Here we provide a new strategy in the management of young adult amblyopia depending on the fact that amblyopia is not only central (brain) problem but also peripheral one (ocular).

The aim of this study was to compare between two new strategies in the management of amblyopia in young adult patients. In this study we assessed 110 patients with different types of amblyopia, who attended the ophthalmology department -in Tikrit Teaching Hospital- for checking, at the period [July 2013- April 2014].

Full ocular examination was done, including visual acuity, ocular motility and fundus assessment.

The new strategies include plan (A) and plan (B). In plan (A) we choose (55) patients on whom the classical treatment was used (glasses & patching) plus topical Bestoxol drops (topical taurine) & oral Visionace capsules for three months. While plan (B) used in the remaining (55) patients and includes plan (A) plus ocular exercises and ocular stimulation with video games for 3 months.

The age of patients was from 12 to 24 years from both sexes.

The results showed that plan effectiveness was 43.6 % (24) more than 3 lines Snellen chart improvement, 27.3% (15) 2 lines improvement, 9.1% (5) no more than one line, and 20% (11) with no improvement.

Regarding plan (B) the results was 70.9% (39) more than 3 lines Snellen chart improvement, 18.2% (10) 2 lines improvement, 7.3% (4) one line only and 3.6% (2) with no benefits.

No effect of gender on the results, but the younger patients had better results than the older.

Introduction

Amblyopia is a visual disorder involving reduced acuity that cannot be explained by an abnormality in the eye and cannot be corrected optically. [1]

It occurs when one or both eyes did not receive normal visual input during a critical period beginning shortly after birth. [2]

Amblyopia affects about 3% of the adult population. [3]

The most common form of amblyopia, anisometropic amblyopia,

occurs when unequal refractive errors in the two eyes prevented the simultaneous focusing of input on the two retinae. Also common is strabismic amblyopia, which results when the eyes were misaligned so that the brain did not receive coordinated binocular input.

Least common is deprivation amblyopia, which results when patterned visual input to one or both eyes was limited by ptosis (a droopy eyelid that covers the visual axis) or a dense cataract. [4-5]

The effectiveness of standard treatments (patching or occlusion of the unaffected eye) is thought to be tightly coupled to the critical periods of visual development ending around 9 years of age. [6-7]

Despite the fact that many adults with this condition do not have normal 3D vision, treatment is rarely undertaken in adulthood. [8-9]

When a child has an amblyopia-inducing condition, the usual treatment is to first correct the peripheral problems (to straighten the deviating eye, to correct the anisometropia with appropriate optical correction for each eye, or to surgically remove the cataractous lens and replace it with a contact lens of appropriate power).

Then, in the case of monocular problems, patching the better eye is prescribed in an attempt to force usage of the affected eye.[10-13]

Although the initial problem was peripheral and can be repaired (with surgery and/or suitable optical correction), amblyopia arises at the cortical level: the abnormal early input leads to deficits in the tuning of cortical circuits. [7]

Patching treatment for amblyopia is typically tapered off around 6–7 years of age, the age at which children with normal eyes achieve adult-like acuity. In most clinical settings, no further treatment is recommended after that age based on an assumption that there will be no beneficial effect of treatment because the critical period has ended by this age.[14]

However, scattered early reports and many recent studies suggest that there is considerable residual plasticity after age 7 and that vision can be improved well beyond the end of the so-called critical period, even in adulthood.[15-16]

Moreover, the acuity of adults with strabismic and anisometropic amblyopia has been improved by combining patching of the fellow eye with fixation exercises.

Improvements have also been induced by repetitive transcranial magnetic stimulation over the primary visual cortex and Levodopa drug therapies.[17-18]

In adults with normal eyes, playing action video games improves acuity and contrast sensitivity, as well as enlarging the useful field of view, improving the number of moving objects that can be tracked simultaneously, and enhancing selective attention.

Improvements can be induced in the laboratory after as little as 20–40 h of play of a first person shooter video game.[19]

One recent study found that video games can also improve vision in adults with amblyopia. [20]

This study is an attempt to improve vision in amblyopic patient depending on the central factors (patching, visual stimulation) and the peripheral factors (oral and topical supplements).

Patients and methods

The current study is a clinical trial of different two methods of treatment. Plan A management (glasses+ patching+ visionace+ Bestoxol) for three months, and plan B management new strategy of amblyopia treatment (glasses patching+ visionace+ Bestoxol) with ocular stimulation (video games mainly Tetris for 15 minutes daily) and exercises for three months.

The study included 110 patients chosen by convenience sample method from patients attending Tikrit Teaching Hospital at the period from [June 2013 to April 2014].

Sample divided into two groups, each group include 55 patients, there are 28 males and 27 females in each group. Then plan A and plan B applied on each group then followed for three months to assess improvement of amblyopia.

Data collected included general information in addition to full ocular examination was done, including visual acuity, ocular motility and fundus assessment.

Then data summarized and presented by simple tables and figures, and analyzed by using ANOVA test.

Results

One hundred ten (110) patients with different types of amblyopia (mostly anisometropic and strabismic) were included in this trial study to determine the value of new strategies in the management, depending on the fact that amblyopia is central and peripheral problem.

The study was performed in ophthalmology department - in Tikrit Teaching Hospital for the period from July2008-April2009.

Two planes were used, plan (A) which includes (glasses+ patching+ visionace+ Bestoxol) and imposed on 55 young adult amblyopic patients for three months and plan (B) which includes (glasses+patching+ visionace+ Bestoxol with ocular stimulation and exercises) for three months.

According plan (A), 43.6% showed significant improvement in the vision (more than 3 lines) according Snellen chart , 27.3% developed 2 lines improvement, 9.1% one line improvement and 20% remained with no changes.

Table -1- Show the effectiveness of plan A. ((glasses+patching+ visionace+ Bestoxol for three months)).

Figure (1) Effectiveness of plan A.

According plan (B), 70.9% showed significant improvement in the vision (more than 3 lines) according Snellen chart , 18.2% developed 2 lines improvement, 7.3% one line improvement and 3.6% remained with no changes.

Table -2- Showed the effectiveness of plan B. ((glasses+patching+ visionace+ Bestoxol + visual stimulation with video games and ocular exercises for three months)).

Figure -2- Effectiveness of plan B.

The results of improvement comparison between the two planes showed that high percentage of patients get more than 3 lines of Snellen chart in plan (B) more than plan (A) , and only (3.6%) of plan (B) remain without improvement in comparison to (20%) of plan (A) patients.

According statistical studies, significant association between treatment plan and visual outcome with **P-value=0.01.**

Table (3) Comparison of effectiveness of plan A, B in treatment of amblyopia.

Regarding gender association, no significant difference between the two planes effectiveness.

Table (4) Comparison of effectiveness of plan A, B in treatment of amblyopia according to gender.

On the other hand, as shown in Table (5), there was a significant association between age of patients in both planes and visual effectiveness, younger patients developed better results.

Discussion

Occlusion of the preferred fixing eye has been a mainstay of amblyopia therapy for centuries. It is not clear whether their primary goal was to improve visual acuity in the deviated eye or to improve its alignment.[21]

Patching may have been a logical extension of facial masks which were used by Paul of Aegina (625 - 690) to "force" the patients with strabismus to realign their eyes by looking through appropriately located holes in the mask. [22]

Occlusion (or pharmacologic penalization) of the non-amblyopic eye has proven to be an effective treatment for both anisometropic and strabismic amblyopia, although it is sometimes unnecessary in treating anisometropic amblyopia.[23-24]

However, there are patients who do not comply with treatment, who fail to respond to treatment, or who do not experience a complete recovery of normal vision in the amblyopic eye despite complying with the treatment.[25]

As a result, clinicians have studied numerous adjunct or alternative therapies for treating amblyopia.[25]

In this clinical trial study, to compare between two new strategies in the management of amblyopia in young adult patients, suggesting that ambyliopia is not a central problem only but also peripheral, so that the improving of ocular condition with supplements and stimulation will improve vision.

The results showed that oral and topical supplements in plan (A)give a dramatic improvement in visual acuity when used with classical treatment (patching + glasses) , where 43.6% get more than 3 lines Snellen chart, 27.3% 2 lines, 9.1% one line and still 20 % without improvement, which nearly similar to the results of Pediatric Eye Disease Investigator Group trial study.[25]

The obvious response occurs with ocular stimulation by video games and ocular exercises as in plan (B), in

which 70.9% get more than three lines, 18.2% get two lines, 7.3% one line and 3.6% without any response. These results have significant improving over plan (A) and completely different from other studies. (19-20)

According gender association, there is no significant difference between males and females in both planes and this similar to other studies. (16)

The results showed that the degree of visual effectiveness is highly related to younger age groups in the two planes, so that patients of (12) years age group have better prognosis than other groups (37.5% more than 3 lines in plan A and 33.3% in plan B). These results are similar to other studies. (25)

Conclusions

- Patching and glasses correction are not only the available treatment in young adult amblyopia.
- Amblyopia is not a central (brain) problem only, so that the peripheral stimulation with supplements (Visionace + Bestoxol) and visual stimulation (video games + ocular exercises) improve the prognosis of amblyopia .
- Younger age group have best prognosis, so that early management of amblyopia is recommended.

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Table (1). Effectiveness of plan A.

Improvement	Number	%
3 Snellen Chart line>	24	43.6
2 S.C lines	15	27.3
1 S.C. lines	5	9.1
Null	11	20
Total	55	100

Table (2). Effectiveness of plan B

Improvement	Number	%
3 S.C line>	39	70.9
2 S.C lines	10	18.2
1 S.C. lines	4	7.3
Null	2	3.6
Total	55	100

Table (3) Comparison of effectiveness of plan A, B in treatment of amblyopia

Improvement	Plan A		Plan B	
	Number	%	Number	%
3 S.C line	24	43.6	39	70.9
2 S.C lines	15	27.3	10	18.2
More than 1 S.C. lines	5	9.1	4	7.3
Null	11	20	2	3.6
total	55	100	55	100
Chi square=10.9 Correlation=0.3 P-value=0.01 Conclusion: significant association between plans and outcome				

Table (4) Comparison of effectiveness of plan A, B in treatment of amblyopia according to gender

Improvement	gender	Plan A		Plan B		Total	
		number	%	number	%	number	%
3 s.c. line	male	10	37.0	17	63.0	27	100
	female	14	38.9	22	61.1	36	100
2 s.c. lines	gender	number	%	number	%	number	%
	male	7	53.8	6	46.2	13	100
	female	8	66.7	4	33.3	12	100
1 s.c. lines	gender	number	%	number	%	number	%
	male	3	50	3	50	6	100
	female	2	66.7	1	33.3	3	100
Null	gender	number	%	number	%	number	%
	male	8	80	2	20	10	100
	female	3	100	0	0	3	100
Total	male	28	50	28	50	56	100
	Female	27	50	27	50	54	100

Table (5) Comparison of effectiveness of plan A,B in treatment of amblyopia according to age.

Improvement	Age groups (years)	Plan A		Plan B	
		number	%	number	%
3 s.c. line	12-	9	37.5	13	33.3
	14-	7	29.2	10	25.7
	16-	6	25	7	7.9
	18-	2	8.3	5	12.8
	20-	0	0	3	7.7
	22-24	0	0	1	2.6
Total		24	100	39	100
2 s.c. lines	12-	7	46.3	9	90
	14-	6	40	1	10
	16-	2	13.3	0	0
	18-	0	0	0	0
	20-	0	0	0	0
	22-24	0	0	0	0
Total		15	100	10	100
1 s.c. lines	12-	1	20	0	0
	14-	2	40	3	75
	16-	1	20	1	25
	18-	1	20	0	0
	20-	0	0	0	0
	22-24	0	0	0	0
Total		5	100	4	100
Null	12-	1	9.1	0	7.2
	14-	1	9.1	0	0
	16-	3	27.3	2	100
	18-	5	45.4	0	0
	20-	1	9.1	0	0
	22-24	0	0	0	0
Total		11	100	2	100

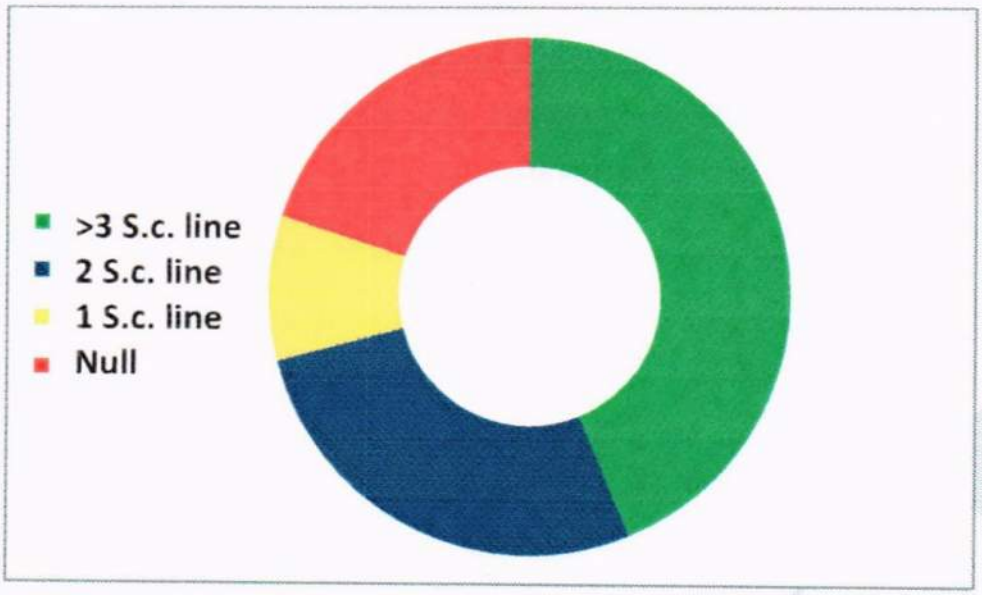

Figure (1) Effectiveness of plan A

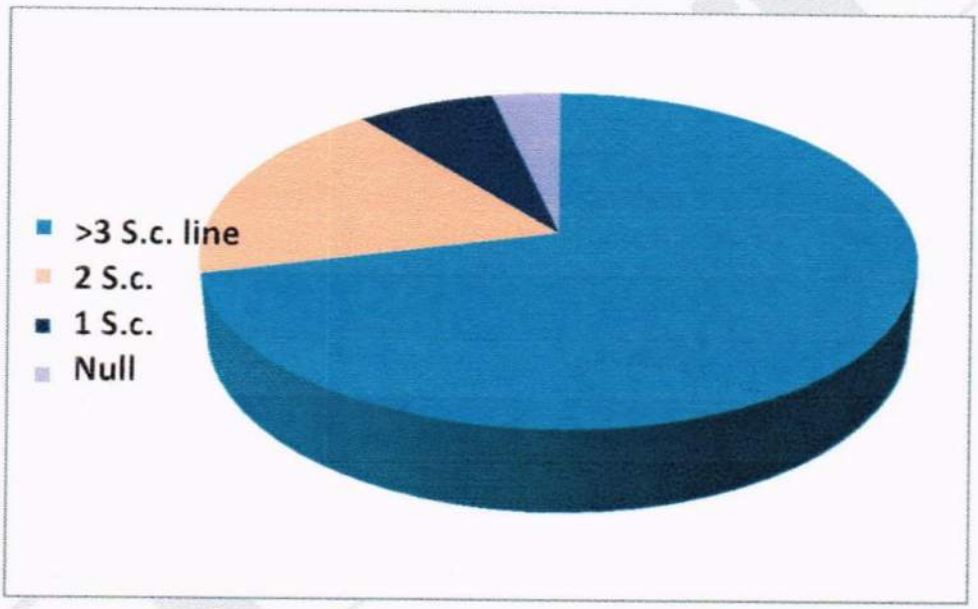

Figure (2). Effectiveness of plan B