Evaluation of Retinal Function in Patients with Bone Marrow Transplantation Using Electroretinogram (ERG)

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Abstract: This study has been conducted with the purpose of studying the frequency of retina disorder by taking benefit from electroretinogram in the patients subject to marrow implantation at Tehran Ghods Clinic. From 50 studied subjects, 25 were in control group while 25 other were in the group subject to marrow implantation. The results of ERG independent test and a, b wave results and delayed time were studied. Information analysis was performed by using SPSS statistical software and T-test. No meaningful statistical relationship was seen between b wave voltage changes among the groups of healthy people and patients subject to marrow implantation (P= 0.815). However, there is a meaningful statistical relationship between b wave delay time changes among the groups of healthy people and patients subject to marrow implantation (P= 0.00). The results indicated meaningful statistical difference between delay phases among the said two groups.

Key words: Electroretinogram EOG · Marrow · Retina · A And B Waves · Vision Disorder

INTRODUCTION

Marrow implantation is one of the therapy methods used in many of hematologic and non-hematologic disorders, which play an important role in improvement of the patients living conditions and promotion of their living quality. As it may be seen, like other surgeries, this surgical operation is not without effects [1]. One of the effects seen after marrow implantation includes the eye effects seen in patients subject to marrow implantation in different forms [2].

Generally speaking, level of occurrence of eye disorders in patients subject to marrow implantation is 51% while the most common observed disorder is eye dryness seen in 12.5% of the patients [3], which may be resulted from consumption of immunity system suppressing drugs and/or other treatment methods. However, existence of more dangerous effects may also be seen in some of the patients, inter alia, effects seen in retina and/or optic nerve may be mentioned [3, 4].

Therefore, conducting the diagnostic studies prior to performing marrow implantation surgery is of high importance in order to determine the level of outbreak of disorder in the phase prior to operation as well as level of improvement or intensification of patients conditions in the post-operation phase [4, 5]. Although different factors are used to examine the vision performance in patients subject to marrow implantation, but applying certain methods having higher diagnostic accuracy may provide faster diagnosis and prevent their progress [4]. One of these methods is electro-physiologic electroretinogram (EOG), which enables assessment of retina performance [6]. Therefore, here we tried to study the level of frequency of retina disorder by using EOG in patients subject to marrow implantation.

MATERIALS AND METHODS

The study was conducted of interval-oriented descriptive-analytical type. The studied population includes patients subject to marrow implantation referred to Tehran Ghods Polyclinic, Iran. The number of patients studied here was 50 people. The sampling method was consecutive. The basis of studied people was primarily patients subject to marrow implantation and then their tendency to attend the study.

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The criterion of exiting the study was those patients who had the vision disorder in advance, or those patients who had not been subject to marrow implantation and also lack of tendency of patients to attend the study were not investigated. After all, information of nobody was disclosed due to ethical considerations.

From amongst 50 studied people, 25 were in control group and 25 other were in the group of patients subject to marrow implantation. In the next stage, for ERG test was conducted for these people and results of a, b wave and delay time were investigated. Eventually, the information analysis was conducted by taking benefit from SPSS statistical software. Meanwhile, independent T-test was used to investigate the relationships among the variables and meaningfulness level to interpret among the relationship was considered less than 0.05.

Method of data collection was based on clinical study and data collection tools were observed as well as questionnaire (ERG test).

RESULTS

Table 1: Results of b wave voltage time in control group Statistics (Control Group)

Factors	Values
N Valid	25
Missing	0
Mean	116.560
Std. Error Mean	3.781
Std. Deviation	18.906
Variance	357.423
Range	70
Minimum	80
Maximum	150

Voltage average in healthy people group was 116.5V with +3.7 Std.Dev. with maximum and minimum of 80 and 150 volts, respectively.

Table 2: Results of b wave voltage time in control group Statistics (Control Group)

Factors	Values
N Valid	25
Missing	0
Mean	43.360
Std. Error mean	0.420
Std. Deviation	2.099
Variance	4.407
Range	8
Minimum	40
Maximum	48

Average b wave delay time in healthy people group was 43.3 mil.sec with +0.42 Std. Dev. with maximum and minimum of 40 and 48 mil.sec, respectively.

Table 3: b wave voltage time results in group of patients with marrow implantation Statistics (Experimental Case) Voltage (b wave)

Factors	Values
N Valid	25
Missing	0
Mean	115.36
Std. Error mean	3.440
Std. Deviation	17.202
Variance	295.907
Range	60
Minimum	88
Maximum	148

Voltage average in healthy people group was 115.3V, with +3.4 Std.Dev, with maximum and minimum of 88 and 148 volts, respectively.

Table 4: b wave delay time results in patients subject to marrow implantationStatistics (Experimental Case) Latency (b wave)

Factors	Values
N Valid	25
Missing	0
Mean	49.24
Std. Error mean	0.994
Std. Deviation	4.969
Variance	24.690
Range	16
Minimum	42
Maximum	58

Average b wave delay time in healthy people group was 49.2 mil.sec, with +0.99 Std.Dev, with maximum and minimum of 42 and 58 mil.sec, respectively.

Table 5: Studying the relationship between delay time changes and b wave voltage, in control and patients groups Group Statistics

	Group	Numbers	Mean	Std. Deviation	Std. Error Mean
Voltage	Control	25	116.56	18.906	3.781
(b wave)	Case	25	115.36	17.202	3.440
Latency	Control	25	43.36	2.099	0.420
(b wave)	Case	25	49.24	4.969	0.994

Table 6: Independent Samples Test

|		Levene's Test for Equality of Variances		T-test for Equality of Means				95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Voltage (b wave)	Equal variances assumed	0.023	0.881	0.235	48	0.815	1.2	5.112	-9.078	11.478
	Equal variances not assumed			0.235	47.578	0.815	1.2	5.112	-9.081	11.481
Latency (b wave)	Equal variances assumed	21.818	0	-5.45	48	0	-5.88	1.079	-8.049	-3.711
	Equal variances not assumed			-5.45	32.303	0	-5.88	1.079	-8.077	-3.683
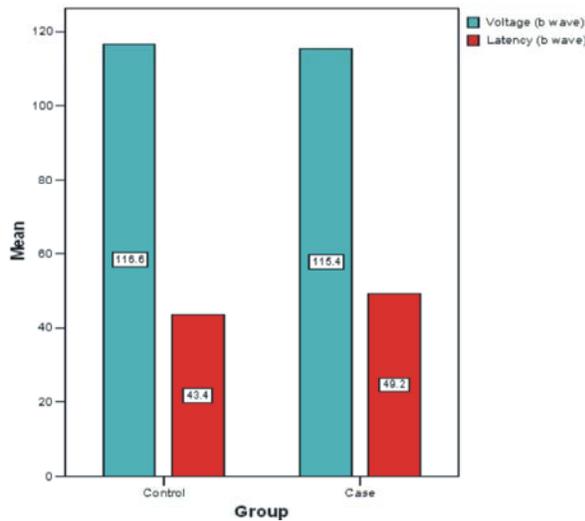
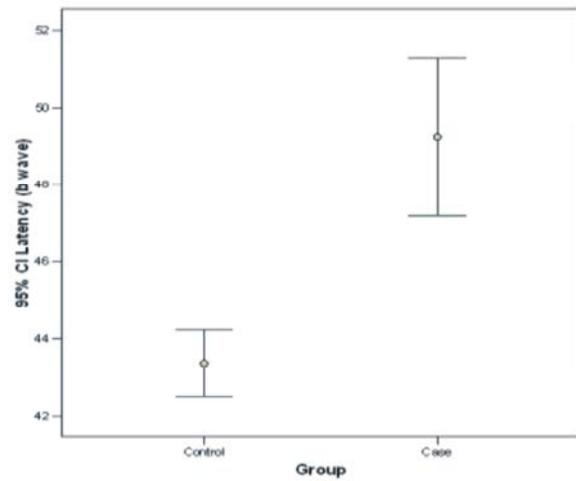Chart 1: Average voltage and b wave delay time in healthy and patients subject to marrow implantation groups

Chart 2: voltage change of b wave in healthy and patients subject to marrow implantation groups

Chart 3: Time changes of b wave delay time in healthy and patients subject to marrow implantation groups
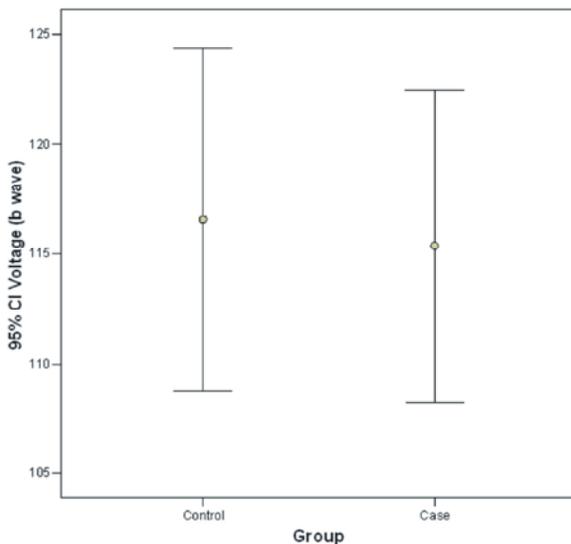
According to T-test, non-meaningful statistical relationship has been seen between b wave voltage changes among healthy people and patients subject to marrow implantation groups (P= 0.815). However, there is a meaningful statistical relationship has been seen between b wave voltage changes among healthy people and patients subject to marrow implantation groups (P= 0.00).

According to the results, voltage changes domain in healthy and patients subject to marrow implantation groups have no meaningful difference with each other, so that the registered average voltage in patients and control groups 115.4 and 116.6 volts, respectively.

According to the results, domain of delay time changes in healthy and patients subject to marrow implantation groups have meaningful difference with each other, so that the average registered delay time in the patients and control groups have been 49.2 and 43.4 mil.sec, respectively.

DISCUSION

The level of the occurrence of eye disorders in patients subject to marrow implantation is 51% while the most common observed disorder is eye dryness seen in 12.5% of the patients [3], which may be resulted from consumption of immunity system suppressing drugs and/or other treatment methods. However, existence of more dangerous effects may also be seen in some of the patients, inter alia, effects seen in retina and/or optic nerve may be mentioned [3, 4].

In a study conducted by Thompson et al., of which the results were published in 1998, it was announced that delay phase registered in potential stimulated from visionary was subject to delay in the post-marrow implantation phase and is therefore lengthened [5, 6]. Also our study findings are in conformity to the same, so that there was a meaningful statistical difference between delay phase (delay time) between patients subject to marrow implantation and healthy people groups.

In a study conducted by Polak et al on Retinitis Pigment Epithelium among the patients subject to treatment by corticosteroids, of which the results were published in 1995, it was announced that corticosteroids result in damaging the retina and retina poisonous degeneration based on ERG test and EOG [7], while the results of this study are in conformity to the same.

In a study conducted by Kal et al in South Korea, of which the results were published in 2011, it was announced that the potential stimulated from visionary is deemed as a suitable test to investigate visionary disorders in post marrow implantation [8, 9].

In this study, we focused on electroretinogram test among patients subject to marrow implantation. Considering the findings of this study, it is suggested that in order to study the retinas of the patients subject to marrow implantation, other diagnostic methods with higher number of samples, some more extensive studies are conducted. These patients shall definitely be investigated in terms of retina performance in order to prevent the effects resulted from therapy.

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