



## Study of Electroretinographical Abnormalities in patients with ocular toxoplasmosis

### KEYWORDS

Toxoplasmosis, Retina, Electroretinography.

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#### ABSTRACT

**Aim:** Toxoplasmosis is a parasitic disease caused by *Toxoplasma gondii* that can affect various parts of the body. Visual system and mainly retina can be affected due to Toxoplasmosis. There are various methods for detection of retinal abnormalities due to Toxoplasmosis. One of the non-invasive techniques for retinal problem diagnosis is Electroretinography (ERG). The aim of present research is to look for probable retinal abnormalities in Toxoplasmosis patients using ERG.

**Method:** In a cross-sectional study 50 subjects referred to Basir clinic were selected randomly. 25 subjects with sero negative Toxoplasmosis were taken as control and 25 with sero positive Toxoplasmosis were selected as control groups.

ERG was recorded in total population. Latency (msec) and voltage ( $\mu\text{V}$ ) of ERG b-wave was measured for each subject. Mean and standard deviation (S.D.) was calculated for two groups. SPSS version 13 was used to compare the results obtained in two groups.

**Results:** The mean latency  $\pm$ S.D was  $42.2 \pm 2.1$  and  $50.3 \pm 3.6$  in control and case groups respectively. The mean amplitude  $\pm$ S.D. was  $125.6 \pm 10.2$  and  $95.4 \pm 7.3$  in control and case groups respectively. The differences between latency & amplitude of ERG b-wave were statistically significant as far as control and case groups are concerned.

**Conclusion:** According to the results obtained Toxoplasmosis degenerate retina of Toxoplasmosis patients which can be diagnosed by ERG technique.

#### Introduction:

Toxoplasmosis is a disease that results from infection with *Toxoplasma gondii* parasite, one of the world's most common parasites. Toxoplasmosis *gondii* has been found worldwide in many species, including carnivorous and herbivorous mammals and birds. It has been found in every population group of human investigated [1].

In the United States it is estimated that 22.5% of the population 12 years and older have been infected with toxoplasma. In various places throughout the world, it has been shown that up to 95% of some populations have been infected with toxoplasma. Infection is often highest in area of the world that has hot, humid climates and lower altitudes. In this respect 55.7% of Malaysian populations are suffering from toxoplasmosis [2]. Toxoplasmosis can affect different organs of human body. Visual system is one of the organs that can be affected due to Toxoplasmosis [3]. Retina is a part of visual system that can be damaged due to Toxoplasmosis. There are different techniques that can evaluate the retinal status of visual system. Electro-physiological examinations are among these techniques. Electroretinography (ERG) and Electrooculography (EOG) are two electrophysiological techniques that measure the electrical responses of various layers of retinal layers [4]. Electrooculography is a technique for measuring the corneal-retinal standing potential that exists between the front and the back of the human eye. Primary applications are in ophthalmological diagnosis and in recording eye movements [5]. Electroretinography measures the electrical responses of various cell types in the retina, including the photoreceptors (rods and cones), inner retinal cells (bipolar and amacrine cells), and the ganglion cells. The ERG is composed of electrical potentials contributed by different cell types within the retina, and the stimulus condition

can elicit stronger response from certain components. If a dim flash ERG is performed on a dark adapted eye the response is primarily from the rod system. Flash ERG performed on light adapted eye will reflect the activity of the cone system. Sufficiently bright flashes will elicit ERG, containing an a-wave (initial negative deflection) followed by a b-wave (positive deflection). The leading edge of the a-wave is produced by the photoreceptors, while the remainder of the wave is produced by a mixture of cells including photoreceptors, bipolar, amacrine, and Muller cells or Muller glia. The pattern ERG, evoked by an alternating checkerboard stimulus, primarily reflects activity of retinal ganglion cell [6]. In the present research work the effect of toxoplasmosis on retinal layer, of the concerned patients was taken in to consideration using ERG technique.

#### Material and Method

In a cross-sectional analytical study fifty subjects were selected randomly. Twenty five patients with sero positive toxoplasmosis was taken as a case group beside the patients twenty five sero negative toxoplasmosis were taken as a control group. Flash ERG was examined in total population. Biomedical Mangoni was the instrument used to record ERG from the patients.

Three electrodes were used to connect the patients to the recording machine, active on cornea, reference on earlobe and earth on forehead. Voltage ( $\mu\text{V}$ ) and latency (msec) of b-wave of ERG was measured for each subjects. Mean and standard deviation were calculated for each group. SPSS-version 13 was used to compare the result obtained in two groups.

#### Results

Table 1 is the measurement of mean voltage & latency in

case & control groups.

ERG parameters	Voltage	Latency
Subjects	( $\mu$ v)/S.D.	(msec)/S.D.
Case	95.4/ 7.3	50.3/ 30.6
Control	125.6/ 10.2	42.2/ 2.1

Table 1: Measurement of voltage ( $\mu$ v)/ S.D. and latency (msec)/ S.D. of ERG b-wave in case and control groups.

According to the Table 1 the mean voltage in case & control groups, were 95.4 ( $\mu$ v) and 125.6 ( $\mu$ v) respectively. The difference between two groups is statistically significant ( $P < 0.05$ ). On the other hand the mean latency in case and control groups are 50.3 (msec) & 42.2 (msec) respectively. The difference in mean latency of case & control groups are also statistically significant ( $P < 0.05$ ).

#### Discussion:

Toxoplasmosis and its adverse effect on Retina in visual system is a matter of interest for many research workers in this area [7, 8]. In present work we measured flash ERG (fERG) in a group of sero positive Toxoplasmosis candidates & we compared it with the subjects with sero negative Toxoplasmosis. It observed that the amplitude of ERG b-wave is reduced in the case group. It is a well known fact that amplitude of ERG b-wave originate from Bipolar and Muller cells in retina in case of fERG [9]. Therefore one

can conclude that in these patients the Bipolar and Muller cells are degenerated due to Toxoplasmosis. Table 1 shows that the latency of ERG b-wave is delayed in sero positive Toxoplasmosis i.e. we get broad ERG b-wave in these patients. Broad ERG b-wave is due to early deep retinal changes [10]. Therefore in these patients the deep retinal layers are also affected.

Riemslog FC et al worked on fERG on the patients with sero positive Toxoplasmosis on 1992 and they obtained reduced photopic ERG which supports the results of present work [11].

Sanaei s et al on 2014 worked on retinal changes in the sero positive Toxoplasmosis patients using Electrooculography. They reported EOG changes in case group. EOG originate from retinal pigment epithelium [RPE]. Therefore RPE is affected in Toxoplasmosis patients. This is correct that they used different technique & considered some other parts of retina but any how the retina is affected, thereby this work also supports the results of present work [12].

#### Conclusion

From the results of present work it can be concluded that toxoplasmosis affects the retinal layers in visual system which can be diagnosed by Electroretinography.

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