Section: Miscellaneous

Original Research Article

VISUAL REACTION TIME IN NEWLY DIAGNOSED HYPOTHYROID FEMALES BEFORE AND AFTER TREATMENT

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ABSTRACT

Background: Dysfunction of the central nervous system (CNS) is an important consequence of thyroid hormone deficiency. Visual reaction time(VRT) provides a reliable and objective measure of function in related sensory system and tracts. Hypothyroidism affects the central nervous system (CNS) through its role in gene expression, myelin production, axonal transportation, and neurotransmitters. Reaction time is the time interval between onset of stimulus and occurrence of response. Normal thyroid functions are essential to the attentiveness and alertness. The patients suffering from the thyroid disease have an altered in the conduction of impulses results in abnormal VRT. The aim of this study was to assess the visual reaction time (VRT) in newly diagnosed hypothyroidism females before and after treatment.

Materials and Methods: Sixty newly diagnosed hypothyroid females in the age group of 18-50 years as the study group A^{BT} (Before treatment) and group A^{AT} (After treatment), using Inquisit 5.0 version software recording simple visual reaction time. The parameters were compared and correlated among hypothyroid female individuals before and after therapy with L- thyroxine by using paired 't'test.

Results: There is significant delayed visual reaction time in hypothyroid individuals were become normal in VRT after proper treatment.

Conclusion: The results of this study concludes that increased visual reaction time in hypothyroid patients was are reversible after three months of proper treatment with L thyroxine.

Keywords: Visual Reaction Time, Hypothyroid.

INTRODUCTION

The eyes are complex sense organs that have evolved from the primitive light-sensitive spots on the surface of invertebrates which transfer information from the environment to the brain, where the image is formed with great acuity. In fact, the neurophysiology of vision is said to be the most studied and perhaps the best understood of the sensory system.[1] Visual Reaction Time is the only clinically objective technique available to assess the functional state of the visual system beyond the retinal ganglion cells.[2] Human body responds to a number of external stimuli of different modalities and gives a desired and purposeful voluntary response to different types of stimuli which is called reaction. It determines alertness of a person because how quickly a person responds to a stimulus is measured by reaction time.[3] Reaction time is the time interval between the application of stimulus and appearance of appropriate voluntary response in a subject. Being voluntary in nature the response is primarily governed by the ability of an individual to concentrate and to establish a body attitude of readiness.[4] Visual reaction time has physiological significance and is a simple and non- invasive test for peripheral and central neural structures. Thus it indicates time taken by an individual to react to external stimulus and it involves reception of the stimulus by the sense organ. It provides indirect index of processing capability of central nervous system and simple means of determining sensory motor association and performance of an individual.[5] Human visual reaction time is influenced by various factors such as age, sex, left or right hand, central versus peripheral

vision, breathing cycle, hormonal changes, personality type, exercise, intelligence, fasting and fatigue of the subject.[6] Gupta Shubham et al, have shown The Visual Reaction Time values were increased in patients having thyroid disorders when compared to their normal control.[8] The Values were found to be higher in hypothyroid subjects when comparison was made amongst the normal subjects. There are few studies on visual reaction time in patients of thyroid dysfunction and effect of treatment. With the help of above studies, the present study was undertaken to assess the visual reaction time in newly diagnosed hypothyroidism females before and after treatment.

MATERIALS AND METHODS

This is an intervention study conducted in a tertiary care centre. The approval of the Ethics committee was obtained prior to the commencement of the study. Sixty newly diagnosed hypothyroid females in the age group of 18-50 years were included. The subjects were informed about the study details, procedures and their acceptance to participate in the study was obtained as written consent from them.

For the purpose of statistical analysis, the study subjects are considered as following groups.

Group A^{BT}: Hypothyroid (newly diagnosed cases, before starting treatment)

Group A^{AT}: Hypothyroid (after treatment with L-thyroxine for minimum 3months and who have attained euthyroid status with therapy)

Pregnant females, history of neurological disorders, psychiatric disorders, any ophthalmological disorders, history of mitotic/mydriatic eye drops usage, history of systemic medication with known central nervous system lesion, diabetes mellitus, systemic hypertension, dyslipidemia, chronic liver & kidney diseases individuals were excluded.

Complete general examination, systemic examination and complete eye checkup were carried out prior to electrophysiological testing. Visual Reaction Time (VRT) were recorded before and after treatment. Results were entered in master excel sheet for statistical analysis. The mean values were compared before and after treatment. Inquisit 5.0 version software was used for recording Simple visual reaction time. The person was seated in front of the computer screen. The test begins with a display of a black cross at the center on the white background. The person was asked to tap the "space bar" on the laptop keyboard when the black cross at the center was replaced by a red circle on the screen after a particular time interval. The test was done in the morning hours, in a quiet secured adequately illuminated room in the presence of only researchers to avoid distractions that might affect one's reaction time. Two sets each of 20 trials were recorded and the average of the 40 trials was taken as the mean visual reaction time of the study participants. In each trial the appearance of red circle was at a variable interval of time. The mean reaction time of the two groups were compared by the paired 't' test . A 'p' value less than 0.05 was taken to denote significant relationship. Microsoft word & excel were used to create the tables, charts and graphs.

RESULTS

The statistical analysis of the data obtained from conducting the visual reaction time in hypothyroid female individuals before therapy and after attaining euthyroid status with L thyroxine was done using the Statistical Package for the Social Sciences (SPSS) software version 22. The Mean and Standard deviation of the variables were determined for the two groups.

The 'paired't test was done between VRT of hypothyroid female individuals before and after therapy with L thyroxine. P value < 0.05 was considered as significant.

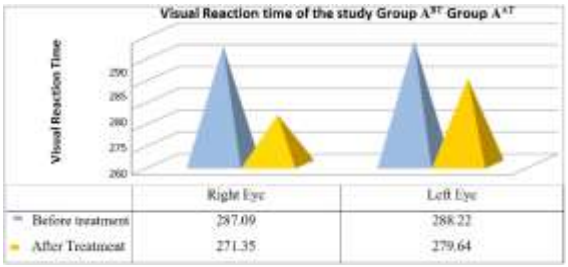

Figure 1: Visual Reaction time of the Group A^{BT} and Group A^{AT} Participants

[Figure 1] shows that the Visual Reaction time of Right and Left eye of the study Group A^{BT} has significantly improved after treatment.

Table 1: Visual reaction time of the group A^{BT} participants

Visual Reaction Time	Minimum	Maximum	Mean	Std. Deviation
Right Eye	272.35	298.72	287.09	7.01
Left Eye	273.34	299.85	288.22	6.76

Table 2: Visual reaction time of the group A^{AT} participants

Visual Reaction Time	Minimum	Maximum	Mean	Std. Deviation
Right Eye	252.35	288.43	271.35	7.79
Left Eye	253.68	292.51	279.64	8.28

[Table 1] Shows that the mean ± SD of right and left eye visual reaction time of the group A^{BT} participants was 287.09±7.01, 288.22±6.76 respectively.

Table 2] shows that the mean±SD of the right and left eye visual reaction time of the group A^{AT} participants was 271.35±7.79, 279.64±8.28 respectively.

DISCUSSION

Hypothyroidism is a disorder of the endocrine system, in which the thyroid gland does not produce enough thyroid hormone. Hypothyroidism has been found to be associated with increased neurological morbidity. Hypothyroidism affects the transmission of impulses in the neurons, by decreasing myelin formation and reducing the activation of reticular activating system, which in turn decreases the general alertness and responsiveness to various stimuli. In hypothyroidism there is very slow conversion of beta carotene to vitamin A which leads to increase in the accumulation of carotene in plasma and tissues.

This study primarily focuses to analyze the visual function in newly diagnosed hypothyroid female individuals in the age group of 18-50 years by doing visual reaction time and the impact of L thyroxine drug over these parameters. Sixty newly diagnosed female subjects (with elevated TSH and decreased T3,T4 levels) were included in the study. After evaluating with visual reaction time, the hypothyroid subjects were started on L thyroxine drug for a minimum three months and serum TSH, T3, T4 levels were measured after three months. After attaining euthyroid levels of serum TSH, T3, T4 the subject's VRT was reassessed. The parameters were compared after therapy with L thyroxine.

Women of age above 35 years have higher risk for hypothyroidism than the younger population with age less than 35years. Hypothyroidism is known to be associated with mental retardation, lack of concentration, memory deficits, motor dysfunction, lethargy, visual and hearing impairment and rarely delirium and coma.

The normal thyroid function is essential for the attentiveness and alertness. Retardation of peripheral or central processes may be partly a cause for delayed visual reaction time in hypothyroid individuals. There is decrease in VRT in hypothyroid after proper treatment.[9-11] It is a well-known fact, that the thyroid hormone affects the myelination. This is probably because of generalized decrease in metabolic rates, affecting the neural pathways, sensory receptors and skeletal muscles.[9]

Our study showed that Visual reaction time (VRT) values were increased in subjects of group A^{BT} when compared to group A^{AT}. This study was consistent with study by Vedavathi K J et al., which showed that hypothyroid patients had longer reaction times that were statistically highly significant.[10]

Therefore, the visual reaction time is an essential prerequisite to test the individual's attentiveness and alertness in hypothyroid patients, Which could contribute more to earlier detection of the visual abnormalities and its complications.

CONCLUSION

The visual pathway activity and functional status of the vision were evaluated in newly diagnosed hypothyroid female individuals using visual reaction time before treatment. Further the subjects were followed up with 3 months of replacement therapy with L thyroxine. After obtaining euthyroid state, the subjects were reevaluated again and the observed parameters were compared. There was also delay in visual reaction time in hypothyroid individuals. It became normal after proper treatment of hypothyroidism. This study shows that there is altered functional status of the visual function in hypothyroidism. In hypothyroid patients, VRT parameters showed significant improvement after replacement therapy with L thyroxine.

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