



ORIGINAL RESEARCH PAPER

Physiology

EVALUATION OF THE MOTOR COMPONENT OF THE MEDIAN NERVE CONDUCTION IN HYPOTHYROID SUBJECTS – A CASE CONTROL STUDY

KEY WORDS: nerve conduction study, median nerve, latency, amplitude, velocity

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ABSTRACT

Background: Neural development, growth and its function depend on thyroid hormones. Overt hypothyroidism is associated with significant alterations both in neuromuscular system and brain functions. Nerve conduction study is useful in diagnosing subclinical polyneuropathy in hypothyroid subjects. In clinical hypothyroidism, peripheral nerve dysfunction may be the main presenting manifestation. The severity of neuromuscular disease in overt hypothyroidism depends upon the duration of hormone deficiency.

Aim: To evaluate the Motor component of Median Nerve Conduction in subjects with hypothyroidism in comparison with normal individuals.

Materials and Method: 30 Hypothyroid individuals in the age group of 18-40 years from Endocrinology O.P. D. Govt. Stanley Medical College, Chennai and 30 age matched controls from Master Health Check up O.P.D. Govt. Stanley Medical College, Chennai were recruited for the study. After proper ethical committee approval and consent from the subjects, Nerve conduction study was done to assess the motor component of median nerve in the Neurophysiology Research Lab, Department of Physiology, Govt. Stanley medical college. Chennai. Results: The motor nerve conduction velocity, amplitude of the Median Nerve are significantly reduced ($p < 0.05$) in hypothyroid individuals when compared to controls. The latency of motor nerve is significantly increased ($p < 0.05$).

Conclusion: Reduction in both amplitude and nerve conduction velocity, increased latency observed in our study suggests subclinical neuropathy in hypothyroid individuals. Hence Electrophysiological studies can be used for the early diagnosis of onset of neuropathy in hypothyroidism.

INTRODUCTION:

Thyroid hormones are very important in mammalian brain maturation, neural cell migration, differentiation, and signalling. In women hypothyroidism is common and it is due to thyroid, pituitary or hypothalamic disorders⁽¹⁾. Thyroid hormone deficiency has direct relationship with the occurrence of neuropathy⁽²⁾.

Polyneuropathy in Overt hypothyroidism ranges from 42 to 72%. The prevalence of hypothyroidism as a cause of polyneuropathy is around 2–4%. Peripheral nervous system involvement is significantly related to the duration of hypothyroidism. Thus long-standing biochemical abnormalities lead to neurologic alterations.

Evaluation of peripheral nerve disease is by doing electrodiagnostic studies, primarily nerve conduction studies. It can document the presence of peripheral nerve disease, define the distribution and pattern of various sensory and motor fibers, and characterize the underlying pathologic processes. Characterising the electrodiagnostic features, particularly whether the process is axonal or demyelinating, adds additional information⁽⁴⁾. The common Nerve conduction parameters done include motor and sensory distal latencies (SDL), and amplitude, motor and sensory conduction velocities (SNCV) in different peripheral nerves. The increased latency and decreased amplitude and decreased NCV in any nerve indicate impairment of that nerve. Hypothyroid individuals present with a sensory–motor Polyneuropathy with a distal–proximal progression.

Deficiency of thyroid hormones cause neuropathy by affecting different peripheral nerves but more commonly the median nerve^(3,4,5). Median nerve is often vulnerable to compression within the carpal tunnel by the flexor retinaculum. The aim of the current study was to assess the degree of motor impairment of the median nerve function using principal electrophysiological parameters in hypothyroid ambulatory patients and compare it with that of the normal individuals.

MATERIALS AND METHODS:

The study had a sample Size of 30. The study had been conducted in the Neurophysiology laboratory, Department of Physiology, Govt Stanley Medical College, Chennai- 1 from 2012 to 2013. 30 Hypothyroid individuals in the age group of 18-40 years from Endocrinology O.P.D. Govt Stanley Medical College, Chennai and 30 age matched Controls from Master Health Checkup O.P.D. Govt Stanley Medical College, Chennai were recruited for the study. After proper ethical committee approval and consent from subjects, Nerve conduction study was done to assess motor component of median nerve in the Neurophysiology Research Lab, Department of Physiology, Govt. Stanley medical college. Inclusion criteria included hypothyroid individuals and exclusion criteria of Diabetes mellitus, alcoholism, liver and kidney disease, other possible causes of neuropathy or neuromuscular diseases and use of drugs known to cause neuropathy or myopathy, malignancy or serious illness, family history of neuropathy. A diagnosis of hypothyroidism was made. Detailed history taking, general examinations including height, weight were done. The study was performed at room temperature. Both the patients and the controls were explained about the procedure and were made to sit in a chair comfortably. Area to be stimulated was cleaned and dried. Motor nerve conduction was performed in STANDARD RMS ENMG EP MARKII MACHINE after entering the patient information^(4,5,6). For motor nerve conduction, gel was applied to the electrodes before placing them to reduce resistance between skin and electrode. active electrode in the motor point and reference electrode 3cm distal at the first metacarpophalangeal joint. Ground electrode placed on the dorsum of the hand. Supramaximal stimulation at point one placing the cathode 3 cm proximal to the distal wrist crease and Stimulation point two the cathode was placed at elbow near the volar crease in antecubital region. The anode was proximal. Statistical analysis was done. Variables compared using independent t-test.

PARAMETERS STUDIED:

Distal Latency, Amplitude, Motor Nerve Conduction Velocity.

RESULTS:

This study revealed significantly higher distal latency (dl) and lower

conduction velocity (MNCV), reduced amplitude in the Median nerve of Hypothyroid group, when compared to controls.

The demographic data and baseline patient characteristics are given in Table 1.

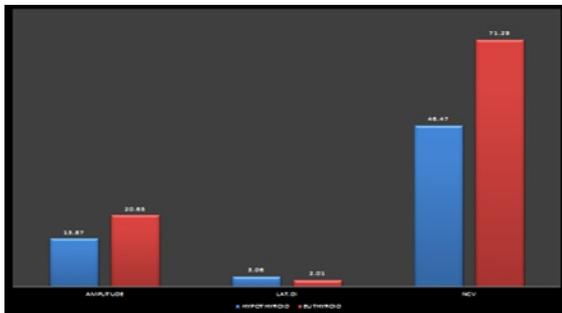
COMPARISON BETWEEN HYPOTHYROID AND EUTHYROID (Table 1)

VARIABLES	Hypothyroid (mean)	Euthyroid (mean)	p Value
BMI	23.02±3.07	20.58±3.97	0.010**
T3 ng/dl	1.89±0.94	3.11±0.86	0.000**
T4 µg/dl	1.13±0.10	1.42±0.23	0.001**
TSH ml U/L	11.44±6.18	2.88 ±1.16	0.007**

** Significant (p<0.05)

In this study, the mean TT3 and TT-4 were significantly lower in hypothyroid individuals in comparison to those of healthy group and TSH was high

(Figure-1) COMPARISON OF NERVE CONDUCTION PARAMETERS BETWEEN HYPOTHYROID AND EUTHYROID



There is a significant increase in distal latency, and decrease in amplitude in motor component of median nerve (p<0.01). Highly significant decrease in conduction velocity in the motor component of median nerve (p<0.05) has been observed.

DISCUSSION:

Misiunas et al noted electrophysiologic changes in peripheral nerve in patients with high basal levels of serum TSH(6). Deposition of Mucopolysaccharides lead to compression of peripheral nerves and resulting in swelling and degeneration of nerves. A mononeuropathy secondary to compression and a polyneuropathy due to either a demyelinating process or primary axonal degeneration may be the cause. (7-8).

In hypothyroidism there is deficiency of ATP and decreased ATPase activity with decreased Na+/K+ pump activity which affects axonal transport leading to peripheral neuropathy(4). Decrease in glycogen degradation also lead to energy deficit in hypothyroidism(3,4,8). Therefore, this study revealed that neuropathy is a common manifestation in patients suffering from hypothyroidism.

CONCLUSION:

All the nerve conduction parameters were altered in the hypothyroid individuals which reveal the presence of subclinical neuropathy. Observed nerve conduction abnormalities in hypothyroid individuals may be due to direct involvement of the nerves or compression caused by mucinous deposits. These findings suggest that a considerable number of untreated hypothyroid patients have subclinical small fibre peripheral neuropathy. Thus Nerve conduction study should be used as a routine screening test for hypothyroid individuals in the out patient department and the need for educating about the significance of proper compliance of medication to the innocent and ignorant public is established.

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