



## ORTHODROMIC SENSORY STUDY IN NERVUS MEDIANUS OF HYPO THYROID SUBJECTS

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### ABSTRACT

**AIM:** To evaluate the Sensory 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 yrs from Endocrinology O.P.D. Government Stanley Medical College, Chennai and 30 age matched Controls from Master Health Checkup O.P.D. Government Stanley Medical College, Chennai were recruited for the study. Nerve conduction study was done to assess the sensory component of median nerve.

**STATISTICAL ANALYSIS:** Variables were compared using independent t-test.

**RESULT:** In this study a significant number of hypothyroid patients showed nerve conduction abnormalities by electrophysiological examination. Latency difference was increased and sensory nerve conduction was delayed in hypothyroid patients.

**CONCLUSIONS:** This study revealed that sensory neuropathy is common in patients suffering from hypothyroidism. This peripheral neuropathy may be due to axonal degeneration or demyelination.

### KEYWORDS

nerve conduction study, median nerve, latency, velocity

### INTRODUCTION:

Hypothyroidism is a common clinical condition especially in women associated with decreased thyroid hormones and increased thyroid stimulating hormone. It is due to disorders of thyroid or Pituitary or Hypothalamus (1). Deficiency of thyroid hormones is directly related to the occurrence of neuropathy. Memory impairment, slowing of mental processes, cognitive dysfunction, depression, nerve entrapment syndromes, ataxia, muscle weakness muscle cramps, pain and numbness are the most common psycho neurological symptoms.

Neurological complications in well-established hypothyroidism is from 42 to 72%(2). The prevalence of Hypothyroidism as a cause of Polyneuropathy is from 2-4 % (3.4). Variations in peripheral nerves are present in myxedematous condition. The severity of the peripheral nervous system involvement is significantly related to the duration of hypothyroidism. Thus a long-standing biochemical abnormality leads to neurologic alterations even in Subclinical Hypothyroidism. It has been reported that nearly 40% of the hypothyroid patients had predominantly sensory signs of a sensorimotor axonal neuropathy early in the course of thyroid disease.

Deficiency of thyroid hormones cause sensory neuropathy by affecting different peripheral nerves but more commonly the median nerve. Median nerve is often vulnerable to compression within the carpal tunnel by the flexor retinaculum.

Nerve conduction studies are most commonly used in neurophysiological laboratories in understanding the diseases of the peripheral nerve. Nerve conduction parameters in patients suffering from hypothyroidism were studied by different investigators to observe the incidence of neuropathy and functional status of peripheral nerves in thyroid deficiency.

The latency or time measure of the nerve is recorded at the point where the waveform begins. It is absolutely necessary to have accurate distance and latency dimensions for accurate nerve conduction values. The common Nerve conduction parameters were sensory distal latencies (SDL), sensory conduction velocities

(SNCV) in different peripheral nerves. The increased SDL and decreased SNCV in any nerve indicate sensory conduction impairment of that nerve. The aim of the current study was to assess the degree of sensory impairment of the median nerve function using principal electrophysiological parameters in hypothyroid ambulatory patients.

### MATERIALS AND METHOD:

This cross sectional study was conducted in 2012-2013 in 30 Hypothyroid individuals in the age group of 18-40 yrs from Endocrinology O.P.D. and 30 age matched healthy participants from Master Health Checkup O.P.D. Government Stanley Medical College, Chennai. After proper ethical committee approval and consent from the subjects, nerve conduction study was done to assess sensory component of median nerve in the Neurophysiology Research Lab, Department of Physiology, Govt. Stanley medical college. Inclusion criteria included hypothyroid individuals of more than 6 months duration with an exclusion criteria of Diabetes mellitus, alcoholism, liver and kidney disease, other possible causes of neuropathy or neuromuscular diseases and use of drugs causing neuropathy, malignancy or serious illness and with a family history of neuropathy, presence of some cardiac pacemakers. A diagnosis of hypothyroidism was made when triiodothyronine (TT3) and/or thyroxine (TT4) were below the normal limits (0.2-0.5 ng/dl and 0.7-1.8ng/dl respectively), and thyrotropin (TSH) was above normal (0.3-4 mIU/l). All 30 hypothyroid patients after confirming the diagnosis were included in the study. Detailed medical history, general examinations including height, weight were done for both groups. All the subjects were female as during my study period there was no male patient. Menstrual, marital history were elicited. The study was performed at room temperature.

Both the patients and the healthy controls were explained about the procedure and were made to sit in a chair comfortably. Area to be stimulated was cleaned and dried. Sensory nerve conduction was performed in abductor hallucis(5). The test was done in STANDARD RMS ENMG EP MARKII MACHINE after entering the details in the prescribed place. Adjustments were made in parameters as sensitivity-20/division, high frequency filter-3kHz,

low frequency filter-20Hz, sweep speed-1ms/division, and averaging 20 times. Gel was applied to the electrodes before placing them to reduce resistance between skin and electrode. The active electrode was applied in the proximal interphalangeal joint, reference electrode in distal interphalangeal joint and ground electrode which acts as a zero reference point was also applied after applying gel before placing them to reduce resistance between skin and electrode.

A stimulus was given at the proximal point along the course of the nerve at wrist between flexor carpi radialis and palmaris longus. Orthodromically (distal nerve stimulation and recording more proximally - Nerve action potentials carried in the physiological direction). Out of 20 responses artifact free response was captured. Distance between stimulating and recording electrode were measured. Latency was measured from the peak of the initial negative deflection and used to calculate conduction velocity. Statistical analysis was done. Variables compared using independent t-test.

**RESULTS :**

**The demographic data and baseline patient characteristics are given in**

(Table - 1)

VARIABLES	HYPOTHYROID(MEAN)	EUTHYROID(MEAN)
AGE(YRS)	30	30
SEX	F	F
HEIGHT (cm)	159.65	162
WEIGHT (kg)	60	58
T3 ng/dl	0.1	0.5
T4 µg/dl	0.5	1.8
TSH mIU/L	12.84	4

In this study, the mean TT3 and TT-4 were significantly lower in hypothyroids in comparison to those of healthy group.

Sensory Component of Nerve Conduction study in Median nerve (Table - 2)

Comparison between the groups using Independent t-test						
	GROUP	Mean	S.D	t-Value	P-Value	Sig.
Latency (ms)	HYPOTHYROID	2.51	.29	5.587	0.000	HS
	EUTHYROID	2.01	.40			
Velocity (m/s) NCV	HYPOTHYROID	54.08	7.21	4.418	0.000	HS
	EUTHYROID	71.29	20.08			

NS-Non Significant,HS- Highly Significant at P<.0001

The collected data was analyzed with SPSS 16.0 version. To describe about the Data, Mean and S.D were used to find the significant difference between the Patients and controls. Independent t-test was used. The null hypothesis was rejected if P<0.05.

This study revealed significantly higher distal latency (SDL) and lower conduction velocity (SNCV) in the median nerve of hypothyroid group in comparison to the controls.

**DISCUSSION:**

The hypothyroid patients neither complained of neurological symptoms nor showed signs of neuropathy.

In this study a significant number of hypothyroid patients showed nerve conduction abnormalities in electrophysiological examination. The hypothyroid groups showed slightly higher sensory distal latency (SDL) with lower sensory nerve conduction

velocity (SNCV) for median nerve. The investigators of different countries in many studies have mentioned about the involvement of median nerve(1,10)

The study of "Peripheral Nerve Function in Subclinical Hypothyroidism" by Jalilzadeh SH, Bahrami A et al(7), showed no significant differences between values obtained for each parameter from patients with subclinical hypothyroidism. Misiunas et al(8) studied electrophysiologic alterations in peripheral nerve function in those with normal basal serum TSH but exaggerated TSH response to TRH, 2) Patients with high basal TSH and normal FT4 and 3) thyroid function tests with normal values. Their findings showed early axonal alterations in patients with subclinical hypothyroidism. high basal levels of serum TSH patients showed more changes(7). The deposition of mucopolysaccharide or the myxedematous tissue lead to compression over the peripheral nerves and results in swelling and degeneration of those nerves. Weight gain may add to this result. A mononeuropathy due to compression by mucinous deposits in the soft tissues surrounding peripheral nerves and a polyneuropathy due to either a demyelinating process or primary axonal degeneration may be the cause.(8,9,11).

Thyroid hormone is responsible for the stimulation of mitochondrial respiratory activity. Hormones increase ATP dependent Na+/K+ pump. In hypothyroidism there is reduced ATPase activity with decreased Na+/K+ pump activity affecting axonal transport causing peripheral neuropathy(10). Glycogen degradation is reduced leading to energy deficit. Neurological dysfunction associated with disorders of the thyroid gland may be a result of hormonal imbalance or may be related to the immune mechanisms associated with thyroid diseases (12,13,14). The thyroid hormone affects the central and peripheral nervous systems via its role in gene expression, myelin production, it's effects on the neurotransmitter system and axonal transportation (10,15,16). Nerve function is affected initially, but later structural alterations may occur (17,18). Since the distal and sensory nerves are affected earlier, the most commonly involved nerves are the sural nerve and median nerve sensory fibers. Also the conduction velocity and latency in sensory component changes when the illness is prolonged with irregular treatment.

**CONCLUSION:**

Nerve conduction study (NCS) helps in delineating the extent and distribution of neural lesions. It enables clinicians to differentiate the demyelination and axonal degeneration. The study has been done to find out the sensory nerve conduction status of Median nerve in order to evaluate presence of sensory neuropathy in hypothyroid patients. The study also aimed for proper and better management and also to create awareness among patients so that they can take early and regular treatment and prevent the occurrence of the peripheral neuropathy. Therefore, this study revealed that sensory neuropathy is common manifestation in patients suffering from hypothyroidism and when there is good compliance to drug the symptoms are reversible. I wish this electrophysiological examination may be routinely done in all women in female O.P to put an end to treating them with multivitamins and thus increasing the productivity of the nation. The participants in this study were women between the ages of 18 and 35. Future studies should include other nerve conduction values, larger age ranges, greater sample size, and greater topographical range and should include both male and female. A larger sample size is required for a calculation of percentiles among different age groups as suggested by Obrien et al as a more effective way of reporting normal values(6). Finally the study is complete only after doing NCS after regular treatment and follow up in different periods.

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