

Neuropathy in cases of Hypothyroidism as Confirmed by Motor Nerve Conduction Studies: A Prospective Study in a Tertiary Care Hospital

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ABSTRACT

Background: Thyroid hormone play important role in development of Central Nervous System and in myelination of neurons. Patients of hypothyroidism may suffer from peripheral nervous dysfunction. Aim of our study is to find out the neuropathy in hypothyroidism. **Methods:** This prospective study was conducted on 40 subjects, out of which n=20 were euthyroid control and n=20 were hypothyroid. The Study was performed in the Medicine department of Saraswathi Institute of Medical Sciences, Hapur in collaboration with the department of Physiology at G.S. Medical College, Hapur. MNCV and latency of Median, Ulnar, and Common Peroneal nerve of both upper and lower limb were done in patients of Hypothyroidism and in Control subjects.

Results: Significant bilateral decrease is observed in the MNCV of the Median Nerve in Hypothyroid subjects as compared to the control subjects. Also, there is Significant bilateral increase in the Motor

Latency of the Median Nerve in Hypothyroid subjects as compared to the control subjects. **Conclusion:** Hypothyroidism cause significant decrease in MNCV of Median Nerve as well as increase in Motor latency in Median Nerve.

Key words: Hypothyroidism, Nerve Conduction Study, Neuropathy.

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INTRODUCTION

Thyroid hormones is an essential determinant in differentiation, growth, and metabolism. Thyroid hormone has major effects on the developing brain in utero and during the neonatal period.^[1,2] Indeed, thyroid hormone is required for the normal function of nearly all tissues, with major effects on oxygen consumption and metabolic rate.^[3] It helps in regulating lipid and carbohydrate metabolism, and thereby influences body mass and mentation. Thyroid hormone play important role in development of Central Nervous System and in myelination of neurons. Thyroid diseases may cause

signs and symptoms of neuromuscular dysfunction.

Patients of hypothyroidism suffer with two major forms of peripheral nervous system dysfunction. The severity of the neuromuscular signs and symptoms are known to be related to the duration and degree of hormonal deficiency and clinical, electrophysiological and morphological improvement following hormone replacement therapy is typical.^[4,6] Approximately one third of patients develop proximal upper and lower limbs' muscle weakness, fatigue, myalgia, and muscle cramps.^[7] Therefore this study was carried out to find out the dysfunction in Motor nerves in hypothyroidism.

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METHODS

This prospective study was conducted in the Medicine

Department of Saraswathi Institute of Medical Sciences, Hapur after approval of the study from the ethical committee; valid written and informed consent was taken from all subjects. Patients of both sexes were taken. 40 patients were selected on the basis of inclusion and exclusion criteria, out of which n=20 were euthyroid control and n=20 were hypothyroid.

Inclusion criterion: Hypothyroid was defined as having raised serum TSH level and decreased free thyroxine (FT4) level.

The equipment used for nerve conduction study was Medicaid System's EMG/NCV equipment with Neuroperfect software. The nerve conduction studies consisted of the determination of the motor nerve conduction velocity (MNCV) and distal motor latencies (DMLs) of the Median, Ulnar and Peroneal nerves. The motor and mixed nerve was stimulated at two points along its course. The stimulation intensity was adjusted to record a Compound Muscle Action Potential (CMAP).^[5]

The statistical analysis was done by Unpaired t Test.

RESULTS

Mean age of cases were 35.7(3.51), and for control group is 35.5(3.81). there is no significant difference in age between cases and control group. Sex and BMI matching is also not significant.

Mean Motor Nerve Conduction Velocity of Median nerve on right side in Cases is 52.01(7.43) and that of Control group is 58.78(3.49). A Significant decrease in MNCV of the Median Nerve on right side in Hypothyroid subjects is observed as compared to the control subjects. MNCV of Ulnar and Common peroneal nerves on right side does not show significant decrease in Hypothyroid, as compared to the control subjects.

Mean Motor Nerve Conduction Velocity of Median nerve on left side in Cases is 52.81(7.46) and that of Control group is 59.68(5.19). A Significant decrease in MNCV of the Median Nerve on left side in Hypothyroid subjects is observed as compared to the control subjects. MNCV of Ulnar and Common peroneal nerves on left side does not show significant decrease in Hypothyroid, as compared to the control subjects.

Motor Latency of Median Nerve on Right side in Cases is 4.08(1.12) and in control group is 3.75(.45). There is significant increase in latency on right side in in Hypothyroid subjects as compared to the control subjects. Motor Latency of Ulnar and Common peroneal nerves on right side does not show significant increase in Hypothyroid, as compared to the control subjects.

Motor Latency of Median Nerve on left side in Cases is 3.49(.67) and in control group is 3.13(.59). There is significant increase in latency on left side in in Hypothyroid subjects as compared to the control subjects. Motor Latency of Ulnar and Common peroneal nerves on left side does not show significant increase in Hypothyroid, as compared to the control subjects.

Table 1: Comparison between Motor Nerve Conduction Velocity (MNCV) of Right side nerves in both the Hypothyroid (n=20) and the control subjects (n=20).

Parameter	Control N=30	CASE (Hypothyroid) (n=30)
Median Nerve	58.78(3.49)	52.01(7.43)
Ulnar Nerve	63.30(10.72)	61.01(7.89)
Common Peroneal Nerve	49.90(7.35)	48.0(7.12)

Table 2: Comparison between Motor Nerve Conduction Velocity (MNCV) of Left side nerves in both the Hypothyroid (n=20) and the control subjects (n=20).

Parameter	Control N=30	CASE (Hypothyroid) (n=30)
Median Nerve	59.68(5.19)	52.81(7.46)
Ulnar Nerve	61.53(7.12)	60.68(6.75)
Common Peroneal Nerve	50.25(5.15)	48.76(5.29)

Table 3: Comparison between Motor Nerve Latencies of Right side nerves in both the Hypothyroid (n=30) and the control subjects (n=30).

Parameter	Control N=30	CASE (Hypothyroid) (n=30)
Median Nerve	3.75(.45)	4.08(1.12)
Ulnar Nerve	3.27(.42)	2.96(.61)
Common Peroneal Nerve	4.16(.62)	4.28(.69)

Table 4: Comparison between Motor Nerve Latencies of Left side nerves in both the Hypothyroid (n=30) and the control subjects (n=30).

Parameter	Control N=30	CASE (Hypothyroid) (n=30)
Median Nerve	3.13(.59)	3.49(.67)
Ulnar Nerve	3.23(.49)	3.31(.56)
Common Peroneal Nerve	4.18(.62)	4.38(.71)

DISCUSSION

In our study the MNCV of median nerve is found to be significantly decreased on right as well as left side in hypothyroid subjects as compared on the MNCV of median nerves in control subjects. Also motor latency of median nerve is increased in hypothyroid subjects as compared to motor latency of control subjects these finding are consistent with somay et al.^[6] Yüksel et al in their study also found the same results but their sample size was small.^[7] Under physiological conditions, the thyroid hormone is responsible for the stimulation of mitochondrial respiratory activity, thus helping production of energy, in the form of ATP, during aerobiosis.

Thyroid hormone seems to increase ATPase activity and, consequently, the activity of the ATP dependent Na⁺/K⁺ pump. The increase in ATPase activity would be associated with an increase of ATP transport through the mitochondrial membranes. In hypothyroidism, the ATP deficiency and the reduced activity of the ATPase enzyme induces decrease in Na⁺/K⁺ pump activity, with consequent alterations of pump dependent axonal transport.^[8] Cruz et al, (1996) found that 71.42% of cases classified as Carpal Tunnel Syndrome (CTS) by Motor Nerve Conduction Velocity (MNCV) had symptomatology and with the same incidence, Tinel sign and median nerve territory hypoesthesia were observed.^[9] El-Salem & Ammari., (2006) assessed neurophysiological changes in asymptomatic patients to determine the frequency and pattern of Electromyographic and nerve conduction studies (NCS) changes in these patients and to see if these changes are reversible. Motor neuropathy was more common than sensory neuropathy affecting distal and F-wave latencies more often than compound muscle action potential amplitudes. These findings favor a demyelinating rather than an axonal process.

The median nerve was the most commonly affected nerve (30% of patients). The pattern of involvement was consistent with carpal tunnel syndrome, as it showed slowing of nerve conduction across the wrist.^[10]

CONCLUSION

We conclude that hypothyroidism causes significant decrease in NCV as well as increase in latency, and this decrease in NCV is more prominent in median nerve. It is proposed that as soon as a patient is diagnosed with hypothyroidism they should be evaluated for decrease in NCV.

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