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Effect of Hypothyroidism on Motor Nerve Conduction Studies: A Cross Sectional Study.

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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:** 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.

Keywords: Hypothyroidism, Nerve Conduction Study, Neuropathy.

INTRODUCTION

Thyroid hormones play critical roles 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]

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O2 consumption by most of the cells in the body is stimulated by thyroid hormones. 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]

Aim of our study is to find out the dysfunction in Motor nerves in hypothyroidism.

MATERIALS AND METHODS

After approval of the study from the ethical committee of J.N. Medical College; valid written and informed consent was taken from all subjects. Patients of both sexes were taken. Sixty subjects were taken, out of which thirty were euthyroid control and thirty were hypothyroid.

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

Exclusion criterion: Patients having other causes of neuropathy like Diabetes mellitus, Renal failure, Neuropathies associated with toxic agents e.g. metal or drugs, Neuropathies associated with malnutrition, alcoholic hepatitis or medication were excluded. Patients having skin lesion or swelling that would interfere with nerve conduction study, previous trauma to the study site were also excluded.

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 or 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 30.6(3.51), and for control group is 32.1(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 54.02(8.53) and that of Control group is 60.68(6.79). 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 53.88(8.84) and that of Control group is 61.58(4.59). 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 4.28(1.02) and in control group is 3.30(.50). 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 3.99(.77)and in control group is 3.43(.68). 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=30) and the control subjects (n=30).

PARAMETER	CONTROL (n=30) M ± SD (m/s)	CASE (Hypothyroid) (n=30) M ± SD (m/s)	p Value
Median Nerve	60.68(6.79)	54.02(8.53)	**<.05***
Ulnar Nerve	63.30(10.72)	61.01(7.89)	>.05
Common Peroneal Nerve	49.90(7.35)	48.00(7.12)	>.05

* P value <.05: Statistically Significant

Table 2: Comparison between Motor Nerve Conduction Velocity (MNCV) of Left side nerves in both the Hypothyroid (n=30) and the control subjects (n=30).

PARAMETER	CONTROL (n=30) M ± SD (m/s)	CASE (Hypothyroid) (n=30) M ± SD (m/s)	p Value
Median Nerve	61.58(4.59)	53.88(8.84)	**<.05***
Ulnar Nerve	62.13(8.30)	61.78(7.95)	>.05
Common Peroneal Nerve	51.95(6.25)	49.88(6.39)	>.05

* P value <.05: Statistically Significant

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) M ± SD (m/s)	CASE (Hypothyroid) (n=30) M ± SD (m/s)	p Value
Median Nerve	3.30(.50)	4.28(1.02)	**<.05***
Ulnar Nerve	3.07(.44)	2.91(.51)	>.05
Common Peroneal Nerve	4.48(.72)	4.68(.79)	>.05

* P value <.05: Statistically Significant

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) M ± SD (m/s)	CASE (Hypothyroid) (n=30) M ± SD (m/s)	p Value
Median Nerve	3.43(.68)	3.99(.77)	**<.05***
Ulnar Nerve	3.23(.59)	3.33(.66)	>.05
Common Peroneal Nerve	4.48(.72)	4.68(.79)	>.05

* P value <.05: Statistically Significant

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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