

A Study of Peripheral Nervous System Alterations in Hypothyroid Patients in North Indians

Ajeet Kumar¹, Ayushi², Gitanjali³, Vijay Kumar Singh⁴

¹3rd Year PG, Department of Physiology, DMCH, Darbhanga, Bihar

²3rd Year PG, Department of Physiology, DMCH, Darbhanga, Bihar

³3rd Year PG, Department of Physiology, DMCH, Darbhanga, Bihar

⁴Associate Professor, Department of Physiology, DMCH, Darbhanga, Bihar

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Corresponding author: Dr. Vijay Kumar Singh

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Abstract

Background: The thyroid gland is the one of the largest endocrine glands. The Greek word 'thyreos' means 'shield' and 'eidos' means 'form'. So it yields its name as it is shield shape in nature. It consists of two lobes connected by an isthmus and located anterior to the trachea between the cricoids cartilage and the suprasternal notch.

Methods: It included 30 cases of hypothyroid patients, of both sexes between the age group of 20 to 60 years. The controls were selected from patients who do not have the thyroid hormone deficiency and attending the medicine and neurology OPD of both sexes of the same age group as cases 20 – 60 years. Study duration of Two years. At DMCH Darbhanga.

Conclusion: Estimation of the nerves conduction values can be considered as a useful parameter in the diagnosis and evaluation of the neuropathy in hypothyroid patients. The presence of carpal tunnel syndrome without clinical neuropathy, suggests that nerve conduction study can be carried out as a routine investigation to find out the electrophysiological alterations without clinical presentation in hypothyroid patients.

Keywords: Neuropathy, Hypothyroid, CTS.

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Introduction

The thyroid gland is the one of the largest endocrine glands. The Greek word 'thyreos' means 'shield' and 'eidos' means 'form'. So it yields its name as it is shield shape in nature. It consists of two lobes connected by an isthmus and located anterior to the trachea between the cricoids cartilage and the suprasternal notch [1]. Normally the thyroid gland is 12 to 20 g in size, soft and highly vascular. The thyroid gland develops from the floor of the primitive pharynx during the third week of gestation [2]. The thyroid secretes two important hormones named thyroxine (T4) and triiodothyronine (T3). These hormones

act through the thyroid hormone receptors α and β by which it plays important physiological role on most of the organs and tissues of the body [3].

Hypothyroidism

It is a disorder in which the thyroid gland is unable to synthesize and secrete sufficient amounts of thyroid hormone to meet the requirement of the brain and peripheral tissues.

Primary hypothyroidism refers to thyroid failures that result from disease of the thyroid gland itself [4]. This condition accounts for over 99% of all the cases of

hypothyroidism. 3 Central hypothyroidism / Secondary hypothyroidism is the term for the thyroid failure caused by pituitary or hypothalamic disorders that result in deficient pituitary production of thyroid-stimulating hormone (TSH) [5]. 3 Overt hypothyroidism describes moderate to severe thyroid failure resulting in high serum TSH levels (TSH >10 μ IU/L) associated with low serum concentrations of total thyroxine (T4) or free T4. Peripheral neuropathy[6]: One of the manifestations of the hypothyroidism is the peripheral neuropathy. The development of this neuropathy is insidious in onset, which will take a long period of time for clinical manifestations.

Peripheral neuropathy is divided in to three types [7] .

1. Mononeuropathy,
2. Mononeuropathy multiplex/mononeuropathy of multiple single nerves &
3. Polyneuropathy Injury to a single nerve produces a condition known as mononeuropathy. Long nerves in the upper limb or forearm or thigh or shin 6 region are the common sites of involvement of mononeuropathy. The nerve compression is the single most common mechanism of injury in mononeuropathies, but it may result from vasculitis or local ischemia.

Objectives

A study of peripheral nervous system alterations in hypothyroid patients in north Indians.

Material and methods

It included 30 cases of hypothyroid patients, of both sexes between the age group of 20 to 60 years. The controls were selected from patients who do not have the thyroid hormone deficiency and attending the medicine and neurology OPD of both sexes of the same age group as cases 20 – 60 years. At Darbhanga medical college and Hospital Darbhanga Laheriasarai, Bihar. Study duration of Two years.

Equipment:

The nerve conduction study is done using Recorders Medicare System (RMS) EMG EPM2K version-1(PHOTO 1). There are three types of electrodes, in nerve conduction studies, the surface electrodes made up of silver chloride and nickel are used frequently. The electrode jelly is applied over the skin after cleaning the skin and surface electrodes are applied over the jelly, which gives an interface between the skin and the equipment.

Results

Three parameters (latency, amplitude and nerve conduction velocity) of motor component of three nerves (Median nerve, Ulnar nerve and Peroneal nerve) and sensory component of three nerves (Median nerve, Ulnar nerve and Sural nerve) were compared between cases (Hypothyroidism) and controls (non-hypothyroid). The physiological data (age, gender and duration of disease) were correlated with nerve conduction values, considering sum of amplitudes and sum of Nerve conduction velocities.

Comparison of median nerve of hypothyroid patients with euthyroid controls.

Right median nerve

The proximal latency of median nerve in controls was 3.45 ± 0.38 and in cases was 3.63 ± 1.03 . The increase in the latency in cases was not statistically significant with p value of 0.39. The distal latency of median nerve in the controls was 7.80 ± 0.58 and that of the cases was 7.44 ± 1.28 . The decrease in distal latency in cases was not statistically significant with p value of 0.16. The motor action potential amplitude of median nerve in the controls was 9.92 ± 1.97 and that of the cases was 10.42 ± 3.14 . The increase in the amplitude in cases was not statistically significance with p value of 0.46. The nerve conduction velocity (NCV) of median nerve in controls was 58.50 ± 4.59 and that of cases was 46.09 ± 8.61 . The

decrease in NCV in cases was highly significant with p value < 0.001.

Left median nerve

The proximal latency of median nerve in the controls was 3.31 ± 0.33 and that of cases was 3.51 ± 1.13 . The increase in the proximal latency in cases was not statistically significant with p value of 0.37. The distal latency of median nerve in the controls was 7.62 ± 0.46 and that of the cases was 7.32 ± 1.41 . The decrease of the distal latency in the cases was not statistically significant with p value of 0.27. The compound motor action potential amplitude of median nerve in the controls was 11.66 ± 3.32 and that of the cases was 12.09 ± 3.94 . The increase in the action potential in cases was not statistically significant with p value of 0.64. The nerve conduction velocity (NCV) of median nerve in the controls was 58.66 ± 5.02 and that of the cases was 60.52 ± 4.77 . The increase in the nerve conduction velocity of the median nerve in the cases was not statistically significant with p value of 0.14.

Comparison of ulnar nerve of hypothyroid and euthyroid subjects.

Right ulnar nerve

The proximal latency of ulnar nerve in the controls was 2.17 ± 0.38 and that of cases was 2.28 ± 0.27 . The increase in the latency in cases was not statistically significant with p value of 0.35.

The distal latency of ulnar nerve in the controls was 6.56 ± 0.79 and that of the cases was 6.69 ± 0.58 . The increase in the latency in cases was not significant with p value of 0.37. The amplitude of ulnar nerve in the controls was 11.77 ± 2.43 and that of the cases was 12.66 ± 3.55 . The increase in the amplitude in the cases was not statistically significant with p value of 0.26. The nerve conduction velocity (NCV) of ulnar nerve in controls was 59.65 ± 7.15 and that of the cases was 53.65 ± 4.02 . The decrease in NCV in cases was highly significant with p value < 0.001.

Left ulnar nerve

The proximal latency of ulnar nerve in the controls was 2.32 ± 0.43 and that of the cases was 2.22 ± 0.29 . The decrease in the proximal latency in the cases was not statistically significant with p value of 0.30. The distal latency of ulnar nerve in the controls was 7.03 ± 0.63 and that of the cases was 6.51 ± 0.46 . The decrease in the distal latency of the ulnar nerve in the cases was not statistically significant with p value of 0.30.

The amplitude of the ulnar nerve in the controls was 12.03 ± 2.37 and that of the cases was 11.51 ± 2.92 . The decrease in the amplitude in cases was not statistically significant with p value of 0.45. The nerve conduction velocity (NCV) of ulnar nerve in controls was 60.12 ± 6.96 and that of the cases was 55.15 ± 5.24 . The decrease in NCV in cases was significant with p value < 0.01.

Comparison of peroneal nerve of hypothyroid and euthyroid subjects.

Right peroneal nerve

The proximal latency of peroneal nerve in the controls was 3.44 ± 0.50 and that of the cases was 3.11 ± 0.80 . The decrease in cases was not statistically significant with p value of 0.06. The distal latency of peroneal nerve in the controls was 10.35 ± 0.88 and that of cases was 9.77 ± 0.80 . The decrease in the latency in cases was statistically significant with p value of < 0.05. The amplitude of peroneal nerve in the controls was 6.6 ± 1.92 and that of the cases was 6.08 ± 2.32 . The decrease in the amplitude in cases was not significant with p value of 0.34. The nerve conduction velocity (NCV) of peroneal nerve in the controls was 47.95 ± 9.95 and that of the cases was 48.59 ± 5.59 . The increase in the conduction velocity of the right peroneal nerve in the cases was not statistically significant with p value of 0.26.

Left peroneal nerve

The proximal latency of peroneal nerve in the controls was 3.40 ± 0.53 and that of the

cases was 3.41 ± 0.42 . The increase in the proximal latency of the left peroneal nerve in the case was not statistically significant with p value of 0.92. The distal latency of peroneal nerve in the controls was 10.28 ± 0.81 and that of the cases was 10.72 ± 0.96 . The increase in the cases was not statistically significant with p value 0.61. The nerve conduction velocity (NCV) of peroneal nerve in the controls was 48.90 ± 4.74 and that of the cases was 52.96 ± 7.20 . The increase in the conduction velocity in case was statistical significant with p value < 0.05 .

Comparison of (sensory) median nerve of hypothyroid patients with euthyroid controls.

Right median nerve

The latency of median nerve in the controls was 2.38 ± 0.35 and that of the cases was 2.71 ± 1.06 . The increase in the case was not statistically significant with p value of 0.10.

The amplitude of median nerve in the controls was 61.74 ± 30.63 and that of the cases was 46.80 ± 25.83 . The decrease in the amplitude in cases was significant with p < 0.05 . The nerve conduction velocity (NCV) of median nerve in the controls was 61.03 ± 10.89 and that of the cases was 55.23 ± 14.88 . The decrease in the cases was not statistically significant with p value of 0.90.

Left median nerve

The latency of median nerve in the controls was 2.29 ± 0.47 and that of the cases was 2.65 ± 1.32 . The increase in the cases was not statistically significant with p value of 0.17. The amplitude of median nerve in the controls was 58.23 ± 29.25 and that of the cases was 62.23 ± 25.13 . The increase in the cases was not statistically significant with p value of 0.052. The nerve conduction velocity (NCV) of median nerve in the controls was 62.76 ± 10.94 and that of the cases was 58.26 ± 16.17 . The decrease in the conduction velocity in the cases was not statistically significant with p value of 0.21.

Comparison of ulnar nerve of hypothyroid and euthyroid subjects

right ulnar nerve

The latency of ulnar nerve in the controls was 1.87 ± 0.26 and that of the cases was 1.71 ± 0.29 . The decrease in the latency in cases was not statistically significant with p value 0.08. The amplitude of ulnar nerve in the controls was 53.53 ± 28.12 and that of the cases was 65.53 ± 36.33 . The increase in the amplitude in cases was not statistical significant with p value of 0.15. The nerve conduction velocity (NCV) of ulnar nerve in the controls was 64.10 ± 29.49 and that of the cases was 63.36 ± 9.49 . The decrease in the conduction velocity in the cases was not statistically significant with p value of 0.15. Comparison of ulnar nerve of hypothyroid and euthyroid subjects left ulnar nerve. The latency of ulnar nerve in the controls was 1.91 ± 0.42 and that of the cases was 1.71 ± 0.54 . The decreased latency of ulnar nerve in the cases was not statistically significant with p value of 0.11. The amplitude of ulnar nerve in the controls was 48.53 ± 2.12 and that of the cases was 55.00 ± 3.33 . The increase in the amplitude of the ulnar nerve in the cases was not statistically significant with p value of 0.08. The nerve conduction velocity (NCV) of ulnar nerve in the controls was 57.63 ± 10.15 and that of the cases was 65.76 ± 14.5 . The increase conduction velocity in case was not statistically significant with p value of 0.05. Comparison of sural nerve of hypothyroid and euthyroid subjects

Right sural nerve

The latency of sural nerve in the controls was 2.44 ± 0.67 and that of the cases was 2.53 ± 0.73 . The increase in the latency in cases was not statistically significant with p value of 0.60. The amplitude of sural nerve in the controls was 12.28 ± 7.48 and that of the cases was 13.30 ± 10.79 . The increase in the amplitude in cases was not statistically significant with p value of 0.67. The nerve conduction velocity (NCV) of sural nerve in the controls was 56.70 ± 22.11 and that of

the cases was 50.64 ± 14.93 . The decrease in cases was not statistically significant with p value of 0.22.

Discussion

Hypothyroidism is an endocrine disorder of deficient thyroid hormone levels in the circulation. It can affect multiple system in our body including nervous system, musculoskeletal system, cardiovascular system, respiratory system, gastrointestinal system, reproductive system and genitourinary system. Thyroid hormones are essential for the normal functioning of the brain and nervous system [8]. Endocrine manifestations depend on the cause of the disease, duration and severity of hypothyroidism. Nerve conduction study (NCS) provides the greatest help in assessing the peripheral nerve disorder. Prolonged nerve conduction time, decreased amplitude and longer latencies are the well documented features of neurological findings in hypothyroidism and that can be reversed with treatment. [9-12]

More common presenting feature is the carpal tunnel syndrome with 29% incidence [13]. The connective tissues of the tendon get thickened and entrap the median nerve, which is the reason for the carpal tunnel syndrome. [14] In our present study we find that the nerve conduction velocity is reduced in right median, right and left ulnar and left common peroneal nerves. Somy G et al [26] reported slowed nerve conduction velocity in median, ulnar and sural nerves [15].

Conclusion

Estimation of the nerves conduction values can be considered as a useful parameter in the diagnosis and evaluation of the neuropathy in hypothyroid patients. The presence of carpal tunnel syndrome without clinical neuropathy, suggests that nerve conduction study can be carried out as a routine investigation to find out the electrophysiological alterations without

clinical presentation in hypothyroid patients

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