

## TO EVALUATE THE SENSORY CONDUCTION PARAMETERS IN HYPOTHYROIDISM: AN INSTITUTIONAL BASED PROSPECTIVE STUDY

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### ABSTRACT:

**Background:** Hypothyroidism is an endocrine disorder which results in neurological dysfunction. It also affects brain, peripheral nerves and muscular system. The study was undertaken to evaluate the sensory nerve conduction parameters in hypothyroidism.

**Materials and Methods:** A present case control study was done in the patients of hypothyroidism to evaluate the sensory conduction. Fifty cases of Hypothyroidism with increased serum Thyroid Stimulating Hormone (TSH), and decreased serum FT4 and fifty normal subjects were included in the study. Sensory examination was done. Nerve Conduction Studies were carried out according to standardized protocols for bilateral median, ulnar, and sural sensory response. Nerve Conduction Velocity were recorded. The increased SDL and decreased SNCV in any nerve indicate sensory conduction impairment of that nerve. The recorded data was compiled and data analysis was done using SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA).

**Results:** In the present study while comparing the SNCV between the two groups, the SNCV of right median ( $43.65 \pm 8.12$ ) was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of right median ( $50.45 \pm 7.67$ ) in the control subjects. The SNCV of left median ( $47.34 \pm 7.13$ ) was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of right median ( $49.56 \pm 6.56$ ) in the control subjects. The SNCV of right ulnar ( $51.12 \pm 6.67$ ) was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of right ulnar ( $53.67 \pm 8.11$ ) in the control subjects. The SNCV of left ulnar ( $52.54 \pm 6.78$ ) was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of left ulnar ( $55.56 \pm 5.34$ ) in the control subjects. The SNCV of right sural ( $42.34 \pm 5.76$ ) was found to be significantly increased in hypothyroid subjects as compared to the SNCV of right sural ( $41.45 \pm 6.42$ ) in the control subjects. The SNCV of left sural ( $41.23 \pm 4.53$ ) was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of left sural ( $41.34 \pm 7.23$ ) in the control subjects.

**Conclusion:** The present study concluded that SNCV between the two groups was found to be significantly decreased in hypothyroid subjects as compared to the SNCV in the control subjects.

**Keywords:** Hypothyroidism, Neurological Dysfunction, Sensory Nerve Conduction.

## **INTRODUCTION:**

Hypothyroidism is a clinical disorder due to the deficiency of thyroid hormone. This hormone is a key regulator of cellular metabolism in our body. This deficient state is estimated to affect 3.8%–4.6% of general population. Hypothyroid state is usually asymptomatic symptoms in the early phase while associated with number of symptoms later affecting skin, heart, endocrine, brain and nerves.<sup>1</sup> Hypothyroidism is an endocrine disorder which results in neurological dysfunction. It also affects brain, peripheral nerves and muscular system. The neurologic manifestations, which may be noted incidentally, occur in conjunction with the systemic features of the disease. The symptoms and signs of neurologic dysfunction may be the presenting feature in some patients and can contribute significantly to disability.<sup>1</sup> The prevalence of neuromuscular dysfunctions in thyroid disorders was found to be 20%–80%.<sup>2</sup> Usually, hypothyroidism has both central and peripheral nerve involvement.<sup>3</sup> Patients develop the usual manifestations of peripheral neuropathy as loss of reflexes, proximal muscle weakness, numbness, paresthesia, decreased sensations, and slowed muscle contraction and relaxation with prolonged.<sup>4</sup> The most common entrapment neuropathy is the carpal tunnel syndrome (CTS), compression of median nerve at the wrist, due to the accumulation of amynoglycane matter.<sup>5</sup> Neuromuscular derangements in hypothyroid patients are mainly metabolic. Main metabolic derangements are the reduction of fatty acid and carbohydrate metabolism which leads to diminished production of ATP. Adrenergic receptors on muscle cells are also reduced in hypothyroid patients resulting in diminished glycogenolysis. Deposits of mucopolysaccharide in peripheral nerves and metabolic disorders of Schwann cells may contribute to peripheral nerve involvement in hypothyroid patients.<sup>6</sup> The study was undertaken to evaluate the sensory nerve conduction parameters in hypothyroidism.

## **MATERIALS AND METHODS:**

A present case control study was done in the patients of hypothyroidism to evaluate the sensory conduction. Fifty cases of Hypothyroidism with increased serum Thyroid Stimulating Hormone (TSH), and decreased serum FT4 and fifty normal subjects were included in the study. Before the commencement of the study ethical approval was taken from the Ethical Committee of the institute and written consent was taken from the patient after explaining the study. Patient with overt hypothyroidism were included in the study. Patients having Diabetes Mellitus, Hypertension, vitamin B12 deficiency and history of Neuropathy, patients taking steroids, neuropathy from other conditions were excluded from the study. Patients included in the study were screened for neuromuscular symptoms. Neurologic examination was done. Sensory examination consisted of pin-prick, light touch, and vibration sensation Nerve Conduction Studies were carried out according to standardized protocols for bilateral median, ulnar, and sural sensory response. Nerve Conduction Velocity were recorded. Abnormalities were defined as deviation from reference values for the testing neurophysiology laboratory, derived from standard norms in the medical literature.<sup>7</sup> The decreased SNCV in any nerve indicate sensory conduction impairment of that nerve. The recorded data was compiled and data analysis was done using SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). P-value less than 0.05 was considered statistically significant.

## **RESULTS:**

In the present study while comparing the SNCV between the two groups, the SNCV of right median ( $43.65 \pm 8.12$ ) was found to be significantly decreased in hypothyroid subjects as

compared to the SNCV of right median ( $50.45 \pm 7.67$ ) in the control subjects. The SNCV of left median ( $47.34 \pm 7.13$ ) was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of right median ( $49.56 \pm 6.56$ ) in the control subjects. The SNCV of right ulnar ( $51.12 \pm 6.67$ ) was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of right ulnar ( $53.67 \pm 8.11$ ) in the control subjects. The SNCV of left ulnar ( $52.54 \pm 6.78$ ) was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of left ulnar ( $55.56 \pm 5.34$ ) in the control subjects. The SNCV of right sural ( $42.34 \pm 5.76$ ) was found to be significantly increased in hypothyroid subjects as compared to the SNCV of right sural ( $41.45 \pm 6.42$ ) in the control subjects. The SNCV of left sural ( $41.23 \pm 4.53$ ) was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of left sural ( $41.34 \pm 7.23$ ) in the control subjects.

**Table 1: Comparison between Sensory Nerve Conduction Velocity (SNCV) of nerves in both the Hypothyroid (n=50) and the control subjects (n=50)**

Parameter		Control (n=50) M $\pm$ SD (m/s)	Case (Hypothyroid) (n=50) M $\pm$ SD (m/s)
Median SNCV	Right side	50.45 $\pm$ 7.67	43.65 $\pm$ 8.12
	Left side	49.56 $\pm$ 6.56	47.34 $\pm$ 7.13
Ulnar SNCV	Right side	53.67 $\pm$ 8.11	51.12 $\pm$ 6.67
	Left side	55.56 $\pm$ 5.34	52.54 $\pm$ 6.78
Sural SNCV	Right side	41.45 $\pm$ 6.42	42.34 $\pm$ 5.76
	Left side	41.34 $\pm$ 7.23	41.23 $\pm$ 4.53

## DISCUSSION:

Thyroid hormone is also known to influence the synthesis of protein and the production of enzyme and of myelin sheath.<sup>8,9</sup> Myelin synthesis is an important factor in determining the speed of impulse transmission along the nerve length.<sup>8,9</sup>

It is well established that thyroid hormones have profound effects on mitochondrial oxidative activity, synthesis and degradation of proteins, sensitivity to catecholamines, differentiation of muscle fibers, and capillary growth and level of antioxidant enzymes and compounds.<sup>10</sup> Demyelination due to oxidative damage to myelin membrane or oligodendroglial cells may result in decrease in nerve conduction velocity.<sup>11</sup> Fall in thyroxine hormone has decreased membrane excitability by decreasing the sodium entry responsible for shoot up of action potential due to hyponatremia.<sup>12</sup>

In the present study while comparing the SNCV between the two groups, the SNCV of right median was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of right median in the control subjects. The SNCV of left median was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of right median in the control subjects. The SNCV of right ulnar was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of right ulnar in the control subjects. The SNCV of left ulnar was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of left ulnar in the control subjects. The SNCV of right sural was found to be significantly increased in hypothyroid subjects as compared to the SNCV of right sural in the control subjects. The SNCV of left sural was found to be significantly decreased in hypothyroid subjects as compared to the SNCV of left sural in the control subjects.

Rao et al.<sup>13</sup> found reduction of amplitude for median sensory nerves whereas Fincham and Cape<sup>14</sup> found it for median and ulnar sensory nerves.

Marcia W.Cruz et al (1996) reported sensory axonal polyneuropathy in 68.7% of patients with primary hypothyroidism.<sup>15</sup>

Gülbün Yuksel et al (2007) noted the similar findings of sensory polyneuropathy in subclinical hypothyroid patients.<sup>16</sup>

Some investigators suggested that the weight gain in the hypothyroid may be a contributory factor for neuropathy. In addition, the deposition of mucopolysaccharides in the tissues surrounding the nerves or the myxedematous tissue may also lead to compression over the peripheral nerves, thereby resulting in swelling and degeneration of the nerves.<sup>17,18</sup>

Neurological dysfunction associated with disorders of thyroid gland could be the result of hormonal imbalance or immune mechanism accompanying thyroid disease. Metabolic alteration in hypothyroidism affects Schwann cells leading to segmental demyelination which is reflected as a decrease in conduction velocity.<sup>19</sup>

### **CONCLUSION:**

The present study concluded that SNCV between the two groups was found to be significantly decreased in hypothyroid subjects as compared to the SNCV in the control subjects.

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