

# Carpal Tunnel Syndrome in Hypothyroidism

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## ABSTRACT

**Introduction:** Carpal Tunnel Syndrome (CTS) is an entrapment neuropathy that occurs due to compression of median nerve in the carpal tunnel and hypothyroidism is one of the important causes of CTS.

**Aim:** To study clinical profile of carpal tunnel syndrome in patients with primary hypothyroidism.

**Materials and Methods:** This was cross-sectional study done in Smt. Kashibai Navale Medical College, Pune, Maharashtra. Adult patients with diagnosis of primary hypothyroidism were included in this study. Patients with other possible causes of CTS were excluded. Detailed medical history was obtained and all patients underwent clinical examination and nerve conduction study by electrophysiological method.

**Results:** Total 36 adult patients were included in this study, 86.1% females and 13.9% males. CTS were found in 6 (16.7%) patients. Increased Body Mass Index (BMI) and presence of clinical symptoms and/or signs of CTS correlated independently with presence of CTS in hypothyroidism. (p-value- 0.03 and < 0.0001 respectively). No correlation was found between gender, age of the patient, duration of disease, serum TSH level, aetiology of the disease, thyroid hormone replacement therapy and occurrence of CTS in hypothyroidism.

**Conclusion:** Increase in BMI is an important risk factor for CTS in hypothyroidism and clinical evidence of CTS is a very sensitive parameter for the same.

**Keywords:** Body mass index, Nerve conduction study, Neuropathy

## INTRODUCTION

Carpal Tunnel syndrome (CTS) is a frequently occurring neuropathy in patients with thyroid diseases [1] Pathogenesis of CTS is not clear in all instances. Anatomically, Carpal Tunnel is a narrow space formed between carpal bones and transverse carpal ligament. It is through this space, median nerve passes to provide motor and sensory function to palm of hands and first four digits of hand. CTS is nonfatal condition but if untreated can cause severe median nerve damage leading to loss of hand function. Hypothyroidism is one of the most important causes of the CTS, which, if diagnosed early can be effectively treated. Excess deposition of glycosaminoglycans, hyaluronic acid and some mucopolysaccharides in subcutaneous tissues causes dermal oedema, in myxoedema. In the narrow space of carpal tunnel, deposition of pseudo mucinous substances on the median nerve sheath leads to compression of the nerve and leads to CTS. Bilateral CTS is more frequently associated with systemic disorder [2].

## AIM

To study clinical profile of carpal tunnel syndrome in patients with primary hypothyroidism.

## MATERIALS AND METHODS

Present study was the prospective, cross sectional observational study, done over a period of one year and was approved by ethics committee of Smt Kashibai Navale medical college and general hospital, Pune, Maharashtra, India.

### Study design

All adult patients (age > 18 Years) with diagnosis of primary hypothyroidism, irrespective of the aetiology, attending outdoor patient department or admitted in medicine wards of Smt. Kashibai Navale Medical College, Pune, Maharashtra, from June 2013 for one year were included in this study. The objectives were explained to each patient and written informed consent

was obtained. Detailed medical history was taken. The common features of CTS like paresthesia, weakness and pain like wrist pain or more proximal pain were asked and documented in the data sheet. Complete medical examination was carried out for every patient. Patients with secondary hypothyroidism or with other possible causes of CTS (e.g., rheumatoid arthritis, and other collagen vascular diseases, pregnancy, injury, malignancy, granulomatous diseases, diabetes mellitus, drugs, gout, renal failure, amyloidosis and work related conditions causing repeated hand and wrist movement) were excluded from this study. The hormones were measured by CIMA for T3, T4 and TSH and nerve conduction studies were done by electrophysiological method. The study was performed at room temperature maintaining normal body temperature. Bilateral median motor and sensory nerve conductions were tested. F responses were also obtained. Distal latency, amplitude and conduction velocity were noted.

## STATISTICAL ANALYSIS

The statistical tests used were Chi-Square tests, unpaired t-test, z-test and Kruskal Wallis test, in case of non homogenous samples. p-value less than 0.05 was considered to be statistically significant. Statistical software Epi Info™ version 7.1.4.0 a trademark of the Centres for Disease Control and Prevention (CDC) was used for statistical analysis.

## RESULTS

Total 40 patients who met inclusion criteria were included in this study. Nerve conduction study was done in all the patients. Nerve conduction study comprising bilateral median motor and sensory conductions including F-responses were recorded and compared in all patients with our laboratory reference data. Four patients with other type of neuropathy were excluded. Thus, sample size comprised of total 36 patients. Baseline characteristics of patients are described in [Table/Fig-1]. After electrophysiological testing, occurrence of CTS was found in 6 (16.67%) patients. Mean and standard deviation (SD) of amplitude, latency, conduction velocity

	Number	%
<b>Gender</b>		
Female	31	86.11
Male	5	13.9
<b>Age(yrs)</b>		
18-30	10	27.8
31-45	15	41.7
46-60	9	25
>60	2	5.5
<b>Duration of disease</b>		
<1yr	15	41.7
1-5 yrs	14	38.9
>5yrs	7	19.4
<b>Aetiology</b>		
Idiopathic	24	66.7
Post Iodine therapy	4	11.1
TPO +ve	8	22.2
<b>BMI</b>		
Normal	12	33.3
Overweight	15	41.7
Obese	9	25
<b>Sr TSH</b>		
Normal	10	27.8
Abnormal	26	72.2
<b>Clinical S/So CTS</b>		
Present	7	19.4
Absent	29	80.6
<b>Thyroid hormone replacement therapy</b>		
Yes	27	75
No	9	25

[Table/Fig-1]: Baseline characteristics of patients (n-36).

Nerve		CTS (n-6)	Normal (n-30)	p-value
Median nerve motor	Amplitude	9.7±4.02	16.1±2.88	0.0004
	Latency	4.2±0.76	2.5±0.43	0.0000
	Conduction velocity	49.2±5.2	53.6±2.86	0.004
Median nerve sensory	Amplitude	31.3±21.14	58.8±18.3	0.002
	Latency	3.2±0.38	2.3±0.30	0.000
	Conduction velocity	39.05±5.7	56.1±4.58	0.000

[Table/Fig-2]: Electrophysiological profile of patients with CTS (n- 6).

of median motor and median sensory nerves in patients with CTS is summarised in [Table/Fig-2]. Of these 6 patients, 4 patients had bilateral and 2 patients had unilateral CTS.

Of 36 total patients, 31 were females (86.1%) and 5 were males (13.9%) and age group was ranging from 20 years to 67 years. In 8(22.2%) patients, TPO antibodies were positive and 4 (11.1%) patients were post radiation therapy and 24(66.7%) were idiopathic. Duration of disease was defined as the period from the diagnosis to the date of enrollment in the study. Duration of disease was less than 1 year in 15(41.7%), 1 to 5 years in 14 (38.9%) and more than 5 years in 7(19.4%) patients. Of 6 patients with CTS, in 2(33.33%) patients duration of disease was <1 year, 1-5 (33.33%) years in 2 patients and >5years in 2(33.33%) patients. Twelve (33.3%) patients had normal Body Mass Index (BMI), 15(41.7%) were overweight and 9(25%) were obese. In 7(19.4%) patients, evidence of carpal tunnel syndrome was present, clinically. TSH level was normal in 10 (27.7%) patients and raised in 26 patients (72.2%). Out of 6 patients with CTS, 5 patients were on thyroid hormone replacement therapy from the diagnosis of the disease.

	CTS (n-6)	N (n-30)	p-Value
<b>Gender</b>			
Female	6 (19.3%)	25 (80.7%)	0.3
Male	0	5 (100%)	
<b>Age(yrs)</b>			
18-30	1 (10%)	9 (90%)	0.56
31-45	3 (20%)	12 (80%)	
46-60	2 (22.2%)	7 (77.8%)	
>60	0	2 (100%)	
<b>Duration of disease</b>			
<1yr	2 (13.3%)	13 (86.7%)	0.6
1-5 yrs	2 (14.3%)	12 (85.7%)	
>5yrs	2 (28.6%)	5 (71.4%)	
<b>Aetiology</b>			
Idiopathic	4 (16.7%)	20 (83.3%)	0.5
Post Iodine therapy	0	4 (100%)	
TPO +ve	2 (25%)	6 (75%)	
<b>BMI</b>			
Normal	1 (8.3%)	11 (91.7%)	0.03
Overweight	1 (6.7%)	14 (93.3%)	
Obese	4 (44.4)	5 (55.6%)	
<b>Sr TSH</b>			
Normal	2 (20%)	8 (80%)	0.5
Abnormal	4 (15.4%)	22 (84.6%)	
<b>Clinical S/So CTS</b>			
Present	6 (85.7%)	1 (14.3%)	<0.0001
Absent	0	29 (100%)	
<b>Thyroid hormone replacement therapy</b>			
Yes	5 (18.5%)	22 (81.5%)	0.52
No	1 (11.1%)	8 (88.9%)	

[Table/Fig-3]: Significant correlates of CTS.

Of these, 2 patients had normal TSH value while in other 3 patients TSH was ranging in between 12 to 18 units. Sixth patient with CTS was newly diagnosed for 3 weeks, with high TSH and was not on any treatment.

Increased BMI and presence of clinical signs and symptoms of CTS correlated independently with presence of CTS in hypothyroidism [Table/Fig-3], while no correlation found between age of the patient, gender, duration of disease, serum TSH level, aetiology of the disease, thyroid hormone replacement therapy and occurrence of CTS.

## DISCUSSION

Compression of median nerve in carpal tunnel at wrist is known as carpal tunnel syndrome. Numbness and paresthesia in thumb, index, middle and half of the ring finger, which may extend proximally are the chief complaints of CTS [2]. The signs of CTS are decreased sensation in median nerve distribution; reproduction of sensory symptoms by tapping the median nerve over the wrist (Tinel's signs) or flexing the wrist for 30-60 seconds and weakness of thumb opposition and abduction. CTS is associated with various occupational and non occupational risk factors [2-5]. Hypothyroidism is shown to be associated with high prevalence and incidence of CTS [5,6]. But R shiri et al., in his meta analysis found only modest association between these [7]. Occurrence of neuropathy is common as age advances. Similar association is found between CTS and advanced age [8,9]. Bland JD proposed different underlying pathogenic mechanism in young and elderly patients with CTS. This was based on different pattern of risk factors for CTS in elderly and young population which he found in his study [9]. Previous studies also mentioned that female

gender as an independent risk factor for CTS and males tend to have more severe CTS [8]. This association with female gender is partly attributed to hormonal factors, underline propensity to musculoskeletal problems and their overall increase frequency in females [10]. In the present study, all the patients with CTS are female patients.

Increase in BMI > 30 is significantly associated with CTS [8]. Werner et al., stated that BMI >29 has 2.5 times more risk for CTS than slender individuals (BMI < 20) [11], while Bland found this association in patients under age 63 years but less significant in older individuals. In obese people, it may be related to the increase fatty tissue or to increased hydrostatic pressure within the carpal tunnel as compared with normal or slender [11].

Mechanism of neuropathy in hypothyroidism is not very clear. CTS in hypothyroidism may be attributed to the deposition of mucinous material or mucopolysaccharides on the median nerve. In uncontrolled hypothyroidism it may also be caused by swelling of the synovial membrane around the tendons in carpal tunnel [12]. Symptoms of CTS are seen in patients of hypothyroidism while they are on thyroid hormone replacement therapy or even when they are euthyroid [13]. This may be explained by the fact that, in early stage of the disease, deposition of mucinous substance may not be severe enough to affect the conductivity of the nerve but clinical signs can come positive due to mechanical tasks. In the present study, one male patient with newly diagnosed hypothyroidism had signs and symptoms of CTS. He had tingling sensations in digits bilaterally with positive Tinel's and Phalen's sign. But nerve conduction study did not confirm the presence of CTS.

Kasem A et al., have studied that CTS can be reversed with 3 months of hormone replacement therapy. Long duration of disease with long term accumulation of mucinous substance or other associated aetiologies other than hypothyroidism may lead to irreversible CTS. Hence, Kasem proposed that hormone replacement therapy should be considered before surgical intervention [14]. We had 6 patients with CTS, of these, 5 patients were on thyroid hormone replacement therapy for more than 6 months but only 2 had normal serum TSH level.

## CONCLUSION

In conclusion, increased BMI is an important risk factor for CTS in patients with hypothyroidism. Clinical evidence of CTS is a very

sensitive parameter for the same. Small sample size and no age or gender matched controls were the limitations of our study.

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