

**A CROSS SECTIONAL STUDY OF CLINICAL ELECTROPHYSIOLOGICAL ,
ULTRASONOGRAPHIC PROFILE IN PATIENTS WITH CARPAL TUNNEL
SYNDROME**

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Abstract

Introduction: Carpal tunnel syndrome, the most common focal peripheral neuropathy, results from compression of the median nerve at the wrist. The syndrome affects an estimated 3 percent of adult Americans and is approximately three times more common in women than in men. High prevalence rates have been reported in persons who perform certain repetitive wrist motions, but the significance of this relationship continues to be challenged.

Materials and methods: Patients above 15 yrs. of age who presented to Neurology Department, Indus hospital, Maharanipet, Visakhapatnam with symptoms and signs of paraesthesia and sensory disturbance of radial three and half fingers with or without objective signs of Tinel's and Phalen. The sample size was 124. All patients above 15 yrs. of age with symptoms of paraesthesia and sensory disturbance of radial three and half fingers and also whole hand with extension to shoulder with or without objective signs of Tinel's and Phalen, who had given informed consent were included in the study.

Results: A total of 124 patients above age 15 yrs. were taken up in the study after applying inclusion and exclusion criteria. Majority of patients were in age group between 41 and 50 yrs. followed by 31 to 40 yrs. and then above 50 yrs. Among 124 patients, 30 (24.2%) were males and 94 (75.8%) were females which indicate female predilection. Paraesthesia was the commonest symptom and it was present in 114 patients (91.9%). Tinel's sign was present in 56 (45.2%) patients and Phalen sign in 52 (21.9%) patients. Among 124 patients, 38 (30.6%) were diagnosed with type 2 diabetes, 14 (11.3%) were hypothyroid, 12 (9.7%) were positive with Rheumatoid arthritis and 6 (4.8%) were diagnosed with renal failure.

Conclusion: Electrophysiological study is the gold standard in diagnosing and grading the severity of CTS. Most common electrophysiological abnormality with bilateral CTS is absent median sensory nerve action potential. Ultrasonogram of the wrist showing increase in cross-sectional area of median nerve irrespective of severity of electrophysiological grading of CTS. Ultrasonogram also helps to rule out structural lesions like ganglion or neuroma and to decide on medical versus surgical treatment.

Key Words: Carpal tunnel syndrome, Paraesthesia, Ultrasonogram, Rheumatoid arthritis.

INTRODUCTION

Carpal tunnel syndrome, the most common focal peripheral neuropathy, results from compression of the median nerve at the wrist. The syndrome affects an estimated 3 percent of adult Americans and is approximately three times more common in women than in men.¹ High prevalence rates have been reported in persons who perform certain repetitive wrist motions, but the significance of this relationship continues to be challenged. Although 30 percent of frequent computer users complain of hand pares-thesias, only 10 percent meet clinical criteria for carpal tunnel syndrome, and nerve conduction studies are abnormal in only 3.5 percent of these persons.²

In addition, CTS can be caused by underlying disorders that affect the carpal tunnel including arthritis, thyroid problems, gout, and diabetes. Pregnancy and obesity increase the risk of developing CTS.³ Even though symptoms suggestive of CTS were significantly associated with younger age, female gender, higher body mass index and occupation, yet there was no proven association with the patterns of electronic devices use. CTS is a clinical diagnosis suspected when the characteristic symptoms and signs are present. The most important of these are nocturnal pain or paresthesia in the distribution of the median nerve.⁴

The definite diagnostic test for CTS is nerve conduction study with high degree of sensitivity, 56% to 86% and specificity 94% to 99%. It demonstrates a distal compression of the median nerve and excludes other peripheral conditions resulting in similar symptoms. Ultrasonogram of the wrist is also used as a diagnostic tool for CTS as it is readily available, non-invasive and helps to assess various parameters of median nerve like size, vascularity, anatomical variations and surrounding structures.⁵

MATERIALS AND METHODS

Study Design: A cross-sectional descriptive study.

Study Population

Patients above 15 yrs. of age who presented to Neurology Department, Indus hospital, Maharani-pet, Visakhapatnam with symptoms and signs of paraesthesia and sensory disturbance of radial three and half fingers with or without objective signs of Tinel's and Phalen. The sample size was 124.

All patients above 15 yrs. of age with symptoms of paraesthesia and sensory disturbance of radial three and half fingers and also whole hand with extension to shoulder with or without objective signs of Tinel's and Phalen, who had given informed consent were included in the study.

Patients who have been previously diagnosed and on treatment for symptoms of carpal tunnel syndrome and other causes of neuropathy were excluded.

Methodology

All subjects who satisfied the inclusion criteria and given their consent for the study underwent detailed neurological evaluation followed by biochemical investigations, electrophysiological study and ultrasonogram of both wrists.

Biochemical investigations done were fasting blood sugar, postprandial blood sugar, thyroid profile, renal function test and Rheumatoid Arthritis factor. Electrophysiological test.

Ultrasonogram of Wrist

All the patients underwent ultrasonogram of wrist. Real time high resolution ultrasonogram (Esaote MyLab 6) with 7.5 MHZ linear array transducer were used in the study. Patients were made to sit at a comfortable position facing the radiologist with forearm resting on the table with palm facing up. Median was assessed in transverse and longitudinal planes in the carpal tunnel by references to anatomical landmarks- pisiform bone or the hook of the hamate or the distal wrist crease. The US criteria (7) we use for diagnosing the median nerve compression at the carpal tunnel include increased cross-sectional area proximally to the compression site, usually at the level of the proximal pisiform bone (Normal cross-sectional area of the median nerve is not greater than 9 mm²) nerve flattening (in the transverse section the nerve is at least 3 times wider than it is thickness) and lower echogenicity.

RESULTS

A total of 124 patients above age 15 yrs. were taken up in the study after applying inclusion and exclusion criteria. Majority of patients were in age group between 41 and 50 yrs. followed by 31 to 40 yrs. and then above 50 yrs. Among 124 patients, 30 (24.2%) were males and 94 (75.8%) were females which indicate female predilection. Paraesthesia was the commonest symptom and it was present in 114 patients (91.9%). Tinel's sign was present in 56 (45.2%) patients and Phalen sign in 52 (21.9%) patients. Among 124 patients, 38 (30.6%) were diagnosed with type 2 diabetes, 14 (11.3%) were hypothyroid, 12 (9.7%) were positive with Rheumatoid arthritis and 6 (4.8%) were diagnosed with renal failure.

Out of 124 patients, 36 (29%) patients had CTS in right hand, 24 (19%) had left CTS and bilateral CTS in 28 (23%) and normal electrophysiological study were present in 36 (29%) out of 124 patients. In bilateral CTS, 24 (85.7%) were females and 4 (14.2%) were males. In right hand CTS, females were 28 (77.8%) and 8 (14.8%) were males and in left hand CTS females were 18 (75%) and 6 (25%) were males.

Age group	Number
31-40	22
41-50	66
Above 50	36

Table 1: Age distribution

Electrophysiological Grading	Right Hand (n=36)	Left Hand n=24	Bilateral n=28
Mild	16 (44%)	8 (33%)	-
Moderate	12 (33%)	12 (50%)	12 (43%)
Severe	8 (22%)	4 (17%)	16 (57%)

Table 2: Electrophysiology Study of CTS Patients

Ultrasound Parameter	Number
Increased cross-section area of median nerve	88
Nerve flattening	70
Lower echogenicity	72

Table 3: Ultrasonographic Study of CTS Patients

DISCUSSION

A total of 124 patients (176 hands) were included in the study as having carpal tunnel syndrome clinically. Majority of patients affected were in age group of 40 to 50 years followed by 30 to 40 years with female predominance compared to male and male: female ratio was 1: 3. In a study by Vinay et al, the mean age was 44.21 years with female predominance (M: F 3: 11) and also in a study by Kasundra et al, mean age was 43.9 ± 4 years and male: female ratio of 13: 79 which was similar in our study.⁶

Commonest symptoms were nocturnal paraesthesia and numbness over radial 3 and half fingers which were present in 91% of patients with Tinel's sign in 45.2% and Phalen's in 41.9%. In a study by Kasundra GM et al, Tinel's test was present in 78.5% and Phalen's test was positive in 84.9%. In a study by Tay LB et al, 70% of patients showed nocturnal paraesthesias.⁷

Majority of patients (43.5%) had no specific cause. Type 2 Diabetes Mellitus (DM) was present in 30.6%, 11.3% were hypothyroid, 9.7% were positive with Rheumatoid arthritis and 4.8% were diagnosed with renal failure which was similar to study done by Hussein Mohammed Malibary et al. DM was the most common associated disease to CTS 35.9% followed by hypothyroidism 14.1%.⁸

Commonest electrophysiological grading in the study was moderate grade, while severe grading of CTS is noted in patients with bilateral CTS.

In our study, ultrasonogram showed increase in cross-sectional area of median nerve at wrist in all 88 (100%) patients, which had abnormal electrophysiological study suggestive of CTS. Sharma M et al from Chandigarh and Min-Kyu Kim et al have studied the role of ultrasonography in diagnosis of carpal tunnel syndrome and found that there was high degree of correlation between ultrasonography and electrophysiological parameters in patients with CTS.⁹ Kapuścińska et al also reported that all patients in their study (n=62) had median nerve compression in ultrasonographic study. Limitations in the study were small sample size and early CTS could have been diagnosed using combined sensory index, which was not measured in the present study.¹⁰

CONCLUSION

Electrophysiological study is the gold standard in diagnosing and grading the severity of CTS. Most common electrophysiological abnormality with bilateral CTS is absent median sensory nerve action potential. Ultrasonogram of the wrist showing increase in cross-sectional area of median nerve irrespective of severity of electrophysiological grading of CTS. Ultrasonogram also helps to rule out structural lesions like ganglion or neuroma and to decide on medical versus surgical treatment.

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