



Utility of Ring Finger Sensory Nerve Conduction Comparative Study for Diagnosis of Carpal Tunnel Syndrome in Diabetic Patients

KEYWORDS

CTS (carpal tunnel syndrome), diabetes, nerve conduction, ring finger

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ABSTRACT *Background-* Carpal tunnel syndrome (CTS) is one of the common neuropathy due to compression of median nerve at wrist; it is frequently encountered in diabetic patients. Different nerve conduction tests are used for confirmation of median nerve abnormalities in clinical CTS.

Aim- Present study aims to investigate utility of ring finger sensory nerve conduction comparisons for diagnosis of CTS in diabetic patients.

Materials & method- Total 60 (30 male, 30 female) diabetic patients participated in the study. We determined & compared; 1) median to ulnar motor nerve response 2) median dig 2 to ulnar dig 5 sensory response 3) median to ulnar ring finger sensory response.

Results- Median to ulnar ring finger antidromic sensory comparisons was found to be most sensitive (93.75%) & specific (97.73%) with 96.67% test accuracy.

Conclusion- We concludes that comparing ring finger sensory nerve conduction is useful for detecting CTS in diabetic patients.

Introduction:

Diabetes mellitus is one of the leading causes of worldwide morbidity & mortality, with increasing population & changing life style diabetes is rapidly rising in Indian population. (1) Diabetes is metabolic syndrome which can affect many organ systems. Diabetic neuropathy can occur in individuals with long standing diabetes mellitus, it may manifests as polyneuropathy, mono neuropathy or autonomic neuropathy. (1) Carpal tunnel syndrome is commonest entrapment neuropathy occurs as result of median nerve compression under transverse carpal ligament. (2) Though carpal tunnel syndrome is multifactorial, it is one of the common neuropathy encountered in diabetic patients. (2) The increased prevalence may relate to metabolic changes, accumulation of fluid in confined space of carpal tunnel. The impairment of median nerve with in carpal tunnel is secondary to compression of median nerve, resulting in mechanical compression or local ischemia. Clinically patient complains of numbness, tingling, burning or pain in hands & fingers associated with localized compression of median nerve at wrist. (3)

Clinical carpal tunnel syndrome can be confirmed using median nerve conduction study, which determines abnormalities of median nerve fibers with in carpal tunnel. However numerous studies have reported that comparison of sensory nerve responses is more effective than use of absolute median nerve latency in documenting the median nerve abnormalities consistent with carpal tunnel syndrome. (4) The aim of present study was to investigate utility of ring finger sensory nerve comparison over routine median nerve conduction in patients attending diabetes outpatient department at tertiary health care Centre.

Materials & method:

This is a cross sectional study, cases were selected from patients attending diabetes (OPD) outpatient department at tertiary care centre. A comprehensive medical & neuro-

logical evaluation was done and diagnosis of clinical carpal tunnel syndrome established using the presence of any four out of following six criteria's: history of parasthesia in hands or marked preponderance of sensory symptoms in hands, nocturnal hand symptoms awakening patient, symptoms precipitated by activities such as holding a newspaper or driving a bike or car relived by hand shaking, predilection for radial digits, weak thenar muscles, or upper limb sensory loss solely with in the distribution of median nerve. (2)

Inclusion & exclusion criteria were under supervision of consultant physician. Those Patients who are diagnosed of generalized neuropathy, associated with other systemic disorders, underwent surgery for carpal tunnel or already on treatment for CTS, any history of trauma to upper limbs and hard line workers were excluded from the study. Total 60 patients (30 male & 30 female) in the age range of 30-50 years, including those diagnosed of clinical carpal tunnel syndrome were included in the study. After detailed explanation written consent was taken and electrophysiological evaluation was done.

We determined and calculated (1) median - ulnar motor nerve responses, median to thenar compared with ulnar to hypothenar, motor latency difference of more than **1.5 milliseconds** was considered abnormal. (2) median digit 2- ulnar digit 5 sensory nerve responses for 14 cm antidromic stimulation & (3) median -ulnar (ring finger digit 4) sensory nerve response for 14 cm antidromic stimulation. Normalized for diabetics, more than **1 milliseconds** latency difference between median & ulnar nerves was considered abnormal. (3, 5-8). RMS EMG-EP-Mark-II instrument was used for recording nerve conduction study parameters & fisher extract test -two tailed was applied for data analysis.

Results:

All 60 patients completed the study. According to medi-

cal & neurologic evaluation, clinical carpal tunnel syndrome was present in 16 patients (4 male & 12 female).

On neurophysiological evaluation

Median to thenar – ulnar to hypothenar motor nerve conduction was abnormal in 7 patients (2 male, 5 female).

Median-ulnar, digit 2 to digit 5, 14 cm antidromic sensory conduction (normalized for diabetic) was abnormal in 11 patients (3 male, 8 females)

Median-ulnar (ring finger) digit 4, 14 cm antidromic sensory conduction (normalized for diabetic) was abnormal in 16 patient (4 male, 12 females)

Sensitivity, specificity, positive predictive value and negative predictive value of all the three neurophysiological parameters are shown in **table 1**. Median-ulnar ring finger antidromic sensory comparisons were found to be most

sensitive (93.75%) & specific (97.73%) with 96.67% of test accuracy.

Table 1. about here

Table 1. Sensitivity, specificity, positive predictive value and negative predictive value of all the three neurophysiological parameters

Median thenar –ulnar hypothenar motor comparative study			
	CTS present	CTS absent	Total
Test positive	5	2	7
Test negative	11	42	53
Total	16	44	60
	percentage	95% confidence interval	
Sensitivity	31.25	14.26-55.6	
Specificity	95.45	84.86-98.74	
Positive predictive value	71.43	35.89-91.78	
Negative predictive value	79.25	66.54-88	
test accuracy	78.33		
Likelihood ratio	6.875		
Median digit1-ulnar digit 5sensory comparative study			
	CTS present	CTS absent	Total
Test positive	9	2	11
Test negative	7	42	49
Total	16	44	60
	percentage	95% confidence interval	
Sensitivity	56.25	33.18-96.4	
Specificity	95.45	84.86-98.74	
Positive predictive value	81.82	52.3-94.86	
Negative predictive value	85.75	73.33-92.4	
test accuracy	85		
Likelihood ratio	12.38		
Median-ulnar ring finger (digit 4)sensory comparative study			
	CTS present	CTS absent	Total
Test positive	15	1	16
Test negative	1	43	44
Total	16	44	60
	percentage	95% confidence interval	
Sensitivity	93.75	71.67-98.84	
Specificity	97.73	88.19-99.6	
Positive predictive value	93.75	71.67-98.89	
Negative predictive value	97.33	88.19-99.69	
test accuracy	96.67		
Likelihood ratio	41.25		

Discussion:

Nerve conduction studies are useful for confirmation of CTS diagnosis and exclusion of other possible causes, such as polyneuropathy which is commonly seen in diabetic patients. In addition nerve conduction study can be used to predict the risk of development of symptoms in asymptomatic patients. (9) Nowadays, increasing understanding about CTS makes it possible to have these patients in their earlier stages of disease in neurophysiology clinics; however up to 40% of the patients with typical symptoms may have no electrophysiological evidence of CTS. (10) Similar observations are seen from present study, out of 16 patients with typical clinical CTS, 11 on motor & 7 on sensory comparative study shows no electrophysi-

ological evidence of CTS. These patients with symptoms of clinical CTS & supportive nerve conduction study findings can be defined as confirmed CTS.

In the present study 2 patients have shown abnormal nerve conduction study despite no typical clinical symptoms of CTS, these patients with abnormal nerve conduction study parameters but no symptoms cannot be labeled as CTS but rather median mono-neuropathy at wrist (MMW). (3) There are many different protocols for median nerve conduction study to help diagnosis of CTS but still there is debate about the most appropriate technique for evaluating median nerve conduction. (10,11) In the present study median, ulnar nerves were stimulated at wrist and motor & sensory distal latencies were recorded and compared, these nerve conduction study findings provided independent information for the evaluation of CTS (12). Sensory comparison techniques at ring finger have shown to be better than absolute sensory latencies and motor distal latency comparisons. Ring finger (dig4) test was ab-

normal with 93.75% sensitivity & 97.73% specificity. These findings are consistent with previous workers (4). Though there is no gold standard for diagnosis of CTS, comparing ring finger sensory latency by stimulating median & ulnar nerves is useful for detecting carpal tunnel syndrome and is in agreement with conventional wisdoms of internal latency comparisons. (13, 14) Therefore it should be used whenever there are clinical signs & symptoms of CTS, but routine nerve conduction studies are normal or borderline. We acknowledge that sample size of our study is small & biological determinants such as age gender, BMI & other anthropometric factors did influence the nerve conduction parameters hence more detailed future studies with large sample size are needed.

Conclusion:

We conclude that ring finger sensory nerve conduction comparative study is definitely useful for diagnosis of carpal tunnel syndrome in clinically suspected diabetic patients.

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