

Diagnostic Value of Median Sensory-Ulnar Motor Latency Difference in Mild Carpal Tunnel Syndrome and it's Comparison with Difference in Sensory and Motor Latencies of Median and Ulnar Nerves

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ABSTRACT

Introduction: Diagnosis of carpal tunnel syndrome (CTS) is based on clinical symptoms, examination findings, and electrodiagnostic studies. Recent studies have shown the efficacy of median sensory-ulnar motor latency difference was devised as another way to improve diagnostic accuracy for mild carpal tunnel syndrome. Current research aimed to study diagnostic value of Median sensory ulnar motor latency difference (MSUMLD) in mild carpal tunnel syndrome and compare it with median-ulnar (MU) sensory and motor latency differences.

Material and methods: 100 hands of CTS were studied and after a detailed history and physical examination, routine tests and nerve conduction study was done. In mild CTS cases not detected by routine NCS, MSUMLD was calculated and its sensitivity was compared with MU sensory and motor latency difference.

Results: It was found that Median Ulnar sensory latency difference had the highest sensitivity.

Conclusion: MSUMLD can be added as a new diagnostic parameter in detecting mild CTS with no additional testing although it's sensitivity is less than Median-Ulnar sensory latency difference

Keywords: Carpal tunnel syndrome (CTS), Median Sensory-Ulnar Motor Latency Difference (MSUMLD), Electrodiagnostic and Sensitivity

INTRODUCTION

Carpal tunnel syndrome is a clinical disorder resulting from the compression of median nerve inside the carpal tunnel at wrist. It is the most common entrapment neuropathy with an estimated prevalence of 2-3%¹, 5.8% in women and 6.6% in men² and a lifetime risk of 10% with an unadjusted incidence in adults of 1 per 1000 person years.³ It is seen more commonly in women and age group of 40- 60 years. The symptoms of Carpal Tunnel Syndrome range from pins and needles sensation and numbness in the distribution of the median nerve to pain which is aggravated mostly during night time.⁴ In advanced stages, there is atrophy of the thenar eminence of hand with weakness in muscles supplied by median nerve

Diagnosis of carpal tunnel syndrome can be made from history and physical examination including provocative tests i.e., Tinel's and Phalen's test.^{5,6} Also electro diagnostic nerve conduction study can be done to confirm the diagnosis,⁷ and exclude other possible causes including cervical radiculopathy or peripheral neuropathy.⁸ The most common

electro diagnostic findings are prolonged terminal latency of motor or sensory median nerve. However, several studies have shown that routine electro diagnostic tests have limited sensitivity and specificity for mild carpal tunnel syndrome for which more sensitive methods are needed.^{9,10,11,12}

In 1993, American Academy of Electrodiagnostic medicine reported sensitivities of electro diagnostic studies ranging from (49%-84%) and specificity $\geq 95\%$.¹³ In some studies, determining the sensory NCV across the palm-wrist segment has been introduced as the most sensitive diagnostic procedure with a sensitivity ranging from 98.5% to 99%.^{14,15} However, radial-median and/or median-ulnar sensory distal latency difference have been reported as the most accurate diagnostic tests in other studies.¹⁶ Also, there is still an ongoing debate on the most appropriate finger for studying the median nerve conduction study.^{14,16} So, there is no consensus about the sensitivity and specificity of different techniques in the diagnosis of carpal tunnel syndrome.

A more recent technique, median sensory-ulnar motor latency difference (MSUMLD) was shown to be useful in previous studies.²⁰ In these studies, ulnar nerve motor latency was taken for comparison with median nerve sensory latency because it was observed that it was the ulnar motor latency which remained clearly normal in the patients of CTS and median sensory latency was the most prolonged latency. So, it was presumed that difference between ulnar motor and median sensory latencies could be used as an early and simple diagnostic method without need for additional testing by stimulation.

So, in this study, we compared median sensory-motor latency difference with motor and sensory latency difference of median and ulnar nerves in patients with normal distal median motor and sensory latencies.

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MATERIAL AND METHODS

The present study was an observational study which was carried out at the Department of Medicine GMC Jammu w.e.f June 2017 to Jan 2018. 64 patients and 100 hands of carpal tunnel syndrome were evaluated. Patients less than 18 years of age, those with a history of trauma to hand, a hand or wrist surgery in the past 1 year, patients with mass, tumour or deformity or fracture of hand or arm were not included in the study and also the patients with polyneuropathy and cervical radiculopathy were excluded.

A detailed history including age, symptom duration, occupational history, personal history including smoking history, history of medical comorbidities like diabetes, hypothyroidism, rheumatoid arthritis etc. was taken. Also a detailed physical examination was done which included BMI, complete neurological examination of both the hands. Routine tests were done which included Blood sugar (Fasting), Thyroid function tests, ESR, RA factor, Lipid profile, RFT's, LFT's. Nerve conduction test was done on both the hands. NCS was done on Recorders and Medicare Systems Machine.

Motor nerve conduction was done by using surface electrodes placed over Abductor Pollicis Brevis for median nerve and Abductor Digitiminimi for Ulnar nerve and stimulating 3cm proximal to the distal crease of wrist. Sensory nerve conduction was done by antidromic stimulation using ring electrodes for recording placed over index finger in case of Median nerve and ring finger in case of Ulnar nerve and stimulating over mid-palm and wrist.

Patients were diagnosed to have carpal tunnel syndrome with conventional tests if distal median motor latency exceeded 4.4ms, distal median sensory latency exceeded 2.9 ms, sensory conduction velocity of median nerve was <40m/s, CMAP of median nerve was less than 4mv or SNAP of Median nerve was less than 8uv. Those patients who had normal conventional tests were evaluated mathematically to find the median and ulnar motor latency difference (prolonged if more than 1.1ms), median and ulnar sensory latency difference (prolonged if more than 0.2ms) and median sensory-ulnar motor latency difference (cut-off 0.7ms) and sensitivities of all the three methods were evaluated.

RESULTS

A total of 100 hands were studied in 63 patients out of which 21 were males and 42 were females. Unilateral involvement was seen in 26 patients and bilateral involvement was seen in 37 patients. Median age of the patients was 50 years with range from 19 to 75 years. CTS was detected by conventional electro diagnostic technique in 58 hands. In rest of the 42 hands, additional calculations were done to determine Median and Ulnar motor distal latency difference, Median and Ulnar sensory latency difference and Median sensory and Ulnar motor latency difference. It was found that Median Ulnar motor latency difference exceeded normal in 21 out of 42 patients (50%), Median Ulnar sensory latency difference was above normal range in 40 out of 42 patients (95%) and Median sensory Ulnar motor latency

Prolonged median motor latency	29 hands	29%
Prolonged median sensory latency	51 hands	51%
Prolonged ulnar motor latency	5 hands	5%
Prolonged ulnar sensory latency	6 hands	6%
Prolonged median ulnar motor latency	71 hands	71%
Diminished Median CMAP	12 hands	12%
Diminished Median SNAP	31 hands	31%
Diminished Ulnar CMAP	18	18%
Diminished Ulnar SNAP	3	3%

Table-1: Electrodiagnostic characteristics of 100 hands

Prolonged Median-ulnar Motor Latency difference	21 hands	50%
Prolonged Median –Ulnar sensory Latency difference	40 hands	95%
Prolonged Median sensory –Ulnar Motor Latency difference	25 hands	60%

Table-2: Comparison of latencies in 42 hands with normal median distal latencies

Distal median motor latency	29%
Distal median sensory latency	51%
Median –ulnar sensory latency difference	98%
Median-Ulnar motor latency difference	71%
Median sensory-ulnar motor latency difference.	83%

Table-3: Showing overall sensitivities distal latencies and comparative latencies in diagnosis of CTS

difference was above normal limits in 25 out of 42 patients (60%) (Table 2). Overall sensitivity of Median Ulnar motor latency difference was calculated to be 71%, Median Ulnar sensory latency difference had an overall sensitivity of 98% and Median sensory ulnar motor latency difference had an overall sensitivity of 83%. (Table 3)

DISCUSSION

This study evaluated the diagnostic value of ulnar motor and median sensory latency difference and compared it with median-ulnar motor latency difference and median –ulnar sensory latency difference. Only 58 hands out of 100 were detected to have CTS on the basis of prolonged motor (29% sensitivity) and sensory (51% sensitivity) median latencies. So, 42% of the cases were having a normal conventional NCS. Uncini et al¹⁰ also found normal NCS in 49% patients and Median Ulnar motor latency difference detected only 10% of the cases out of these where as median ulnar sensory latency difference detected 77% of the cases. However In our study, among rest of the 42 hands CTS was detected by prolonged median –ulnar motor latency difference in 21 out of 42 hands (sensitivity-50%), by prolonged median-ulnar sensory latency difference in 40 out of 42 patients (sensitivity-95%), and by prolonged median sensory –ulnar motor latency difference in 25 out of 42 patients (sensitivity-60%). These findings also match with those of Pauda et al¹⁷ who found that comparative studies detected more number of mild cases than routine studies. However, in study by Witt J C et al¹⁸ only 25% of the patients were having a normal NCS. This

difference may be due to more mild cases in our study.

Overall sensitivity of distal median motor latency to detect CTS was 29% in this study whereas median sensory latency had a sensitivity of 51%. Median Ulnar motor latency difference showed an overall sensitivity of 71%, and overall sensitivity of median motor-ulnar sensory latency difference was 83% which is similar to the study by Bodofsky et al¹⁹ and a study by alMohammadreza et al²⁰ both of which showed a sensitivity of 86% by MUSLD. However, median ulnar sensory latency difference was the most sensitive parameter in our study with an overall sensitivity of 98%.

CONCLUSION

To conclude, many patients with CTS are not picked up with routine electro diagnostic study and instead of doing additional stimulation tests calculating median ulnar sensory latency difference can pick up majority of the patients and it has a better sensitivity than recently proposed median sensory ulnar motor latency difference. However, further studies are needed to be done on a large number of patients and with control group to evaluate this new method.

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