Alexandria Journal of Medicine (2013) **49**, 199–205

Alexandria University Faculty of Medicine

Alexandria Journal of Medicine

www.sciencedirect.com

ORIGINAL ARTICLE

The second lumbrical-interossei latency difference in carpal tunnel syndrome: Is it a mandatory or a dispensable test?

Eman A. Tawfik *, Abeer K. El Zohiery, Nouran M. Abaza

Physical Medicine, Rheumatology and Rehabilitation Department, Faculty of Medicine, Ain Shams University, Cairo, Egypt

Received 1 September 2012; accepted 5 November 2012
Available online 6 December 2012

KEYWORDS

Carpal tunnel syndrome;
Second lumbrical-interossei latency difference

Abstract *Objective:* To assess the value of the 2L-INT latency difference in the electrodiagnosis of the carpal tunnel syndrome (CTS) and evaluate its sensitivity in comparison to other routine median motor and sensory studies.
Methods: The study was conducted on 100 hands with symptoms and signs suggestive of CTS and 100 non-CTS hands as the control group. All were subjected to routine median motor nerve conduction study with stimulation at midpalm, wrist and elbow, median-versus-radial sensory comparison study and Second lumbrical-versus-interosseus (2L-INT) motor comparison study.
Results: The results showed that the most sensitive tests were the median-radial sensory test and the 2LINT test and that both were correlated suggesting that the motor fibers of the median nerve can be compressed as early as sensory fibers.
Conclusion: The 2L-INT test is as sensitive and important as the median-radial sensory test.
Significance: We recommend the routine use of the 2L-INT test in clinically suspected cases of CTS especially in cases where routine median motor studies are normal together with the median-radial sensory test even if the sensory studies are normal.

Abbreviations: 2L-INT, second lumbrical interossei; APB, abductor pollicus brevis; CMAP, compound muscle action potential; CTS, carpal tunnel syndrome; DML, distal motor latency; EDX, electrodiagnostic; EMG, electromyography; NCS, nerve conduction study; SD, standard deviation; SNAP, sensory nerve action potential; ULN, upper limit of normal.

* Corresponding author. Address: Mahmoud Ryad Street, 2nd District, Villa 52, El Shrouk City, Egypt. Tel.: +20 226875026/+20 201005078368.
E-mail addresses: iman.tawfik@gmail.com (E.A. Tawfik), dr.abeerzohiery@gmail.com (A.K. El Zohiery), nouranabaza@hotmail.com (N.M. Abaza).

Peer review under responsibility of the Alexandria University Faculty of Medicine.

ELSEVIER Production and hosting by Elsevier

2090-5068 © 2012 Production and hosting by Elsevier B.V. on behalf of Alexandria University Faculty of Medicine.
http://dx.doi.org/10.1016/j.ajme.2012.11.001

1. Introduction

Median nerve entrapment at the wrist is the most common of all entrapment neuropathies and, consequently, is one of the most frequent reasons of referral to an electrodiagnostic study.

Carpal tunnel syndrome (CTS) is a constellation of symptoms associated with localized compression of the median nerve at the wrist resulting in mechanical compression and local ischemia[1]. Diagnosis is based upon symptoms of numbness, tingling and/or burning in the distribution of the median nerve in the hand. However, the symptoms are frequently documented outside the distribution of the median nerve as well. Repetitive hand activity may cause thickening of the synovial lining of the tendons that share the carpal tunnel with the median nerve[2,3].This increases the volume of tissue within the canal and leads to an increase in the baseline and the mechanical pressure within the carpal tunnel. The combination of ischemic changes and mechanical contact pressure over time, leads to changes in the myelin sheath and occasionally results in injury to the axon. This can be simply detected by conventional neurophysiologic testing such as standard nerve conduction studies (NCS). The exact symptoms or criteria for the diagnosis of CTS remains poorly defined. A consensus conference was organized that identified a combination of symptoms (numbness, tingling, burning and pain in combination with nocturnal symptoms) plus abnormal median nerve function based upon NCS to be the best 'gold standard' for the diagnosis of CTS[4].

The ability to confirm the diagnosis of CTS using electrodiagnostic techniques lies with testing the median nerve fiber across the wrist and comparing the latency and amplitude to normal conduction or comparison of the median nerve segment to some other nerve segment in the same hand that does not travel through the carpal tunnel (either ulnar or radial nerves)[5].

The diagnosis of a median mononeuropathy should not be based solely on a median motor or sensory evoked response using an absolute cutoff value. There are many influences on the amplitude and latency of an individual nerve, which could give a false positive result. Age, gender, obesity, finger diameter, concurrent systemic disease and temperature have all been demonstrated to have an impact on the absolute amplitude or latency of an evoked response in the hand[6–8]. The normative upper limits of normal for an individual nerve absolute latency response can range over 1.4 ms depending on age, gender and obesity[6]. These factors along with the influence of systemic disease are well controlled when the median nerve response is compared to another nerve segment that does not travel through the carpal tunnel or even to the corresponding median nerve in the other hand in unilateral cases[6].

The ulnar nerve is most commonly used for comparison. In such a case, identical distances between the stimulator and recording electrodes for the median and ulnar nerves are used. This technique creates an ideal internal control in which several variables are kept constant including temperature, age and nerve or muscle size. Accordingly, the only factor that varies here is traversing of the median nerve in the carpal tunnel, whereas the ulnar nerve does not. Thus, any preferential slowing of the median nerve can be attributed to conduction slowing the carpal tunnel[5].

One of these precise comparison studies is the second lumbrical-interosseous (2L-INT) latency difference. It is a motor conduction technique that was initially described as being fairly valuable in the diagnosis of CTS[9]. Over the past years, its value has been conflictingly addressed, as there are studies supporting their high diagnostic sensitivity in CTS[10,11], whereas others report a much lower sensitivity[12,13].

Other studies acknowledged that the ability of this technique to localize the median nerve lesion at the wrist in patients with absent abductor pollicus brevis (APB) response represents its major advantage over conventional studies[9–11]. Additionally, it has been recently proposed that this test may help to reduce the number of steps commonly needed to investigate patients with suspected CTS[14].

The aim of this study was to compare the 2L-INT study with routine motor conduction studies, midpalmar motor study and median-versus-radial sensory study in cases with suspected CTS to determine its value and sensitivity.

2. Materials and methods

The study was conducted on 100 hands of patients (a total of 60 patients) with clinical diagnosis of CTS. The affected hand was included whether it was one or both hands of the same patient. In 40 patients, both hands were symptomatic and were included in the study and in 20 patients, the only unilateral symptomatic hand was included. Clinical suspicion was based on symptoms of nocturnal or activity-related pain and/or paresthesia in the median nerve distribution or whole hand with clinical examination showing hypoesthesia in median nerve distribution with or without weakness of thumb abduction and/or opposition ± atrophy of thenar muscles in addition to positive Tinel and/or Phalen's sign.

A control group of 100 non-CTS hands (50 healthy individuals not complaining of any sensory or motor symptoms in the hand and with free neurological examination and negative tests of CTS) were also included. The non symptomatic hands of patients with symptoms suggestive of unilateral CTS were not included in the control group to standardize the controls.

Patients with cervical radiculopathy, peripheral neuropathy and traumatic nerve injuries were excluded from the study, also patients with Diabetes Mellitus.

Exclusion was based on clinical assessment, radiological findings and nerve conduction with F-wave studies.

The study was conducted at the Physical Medicine & Rehabilitation Department at the Ain Shams Hospital (Cairo, Egypt) using Toennies Neuroscreen Plus made by Toennies of Germany. In motor studies, responses were recorded at a sweep speed of 5 ms/division and a gain of 4 mV. In Sensory studies, sweep was adjusted at 2 ms and gain at 20 uV. Temperature was kept constant through all the tests at 33–34 °C.

Consent was taken from all patients and controls after explaining the procedure in detail.

The electrophysiological studies done for both patients and control group (according to Preston & Shapiro, 2005) were:

- Routine median motor nerve conduction study:
- Recorded from Abductor Pollicus Brevis (APB) muscle and stimulated at the wrist (middle of the wrist between the Flexor Carpi Radialis and Palmaris Longus tendons) and at the elbow (Antecubital fossa over the brachial artery pulse). Distal distance was standardized at 7 cm. Distal