

가

The Relationship between Clinical Grading of Carpal Tunnel Syndrome and Sensory nerve Conduction Velocity

Jae-Hyuk Kwak, M.D., Dong-Kuck Lee, M.D.

Department of Neurology, School of Medicine, Catholic University of Daegu

Background: Carpal tunnel syndrome (CTS) is a common condition characterized by entrapment neuropathy of the median nerves. Clinical manifestations are the most important findings for diagnosis and assessment of therapeutic effects. But, objective indicators, such as electrophysiological findings, are also valuable supplementary tools. This study investigated the relationship between clinical grading and sensory nerve conduction velocity (SNCV) of median proper palmar digital nerve (MPPDN) in CTS patients.

Method: This study was done on 90 upper limbs of 53 patients with CTS (men: 6, women: 47, age: 26~69 years, mean age; 52 years). Each SNCV of MPPDN was recorded with bar electrode using antidromic method. Each SNCV was compared with clinical grading of CTS. The clinical grades of CTS were designated as follows; group 1 is mild symptoms, 2 is moderate symptoms, and 3 is severe and longstanding symptoms.

Result: In thumb, the SNCV of MPPDN was not different significantly between 3 groups ($p=0.817$). In the index finger, the SNCV was the fastest in the group 1, but faster in group 3 than in group 2 ($p=0.001$). In the middle and ring fingers, SNCV was decreased in higher clinical grading groups (middle finger: $p=0.015$, ring finger: $p=0.044$).

Conclusion: SNCV of MPPDN of middle and ring finger correlated with the clinical grading of CTS. SNCV of index finger was the fastest in group 1. But SNCV of thumb did not correlate with the clinical grading of CTS.

Key Words: Carpal tunnel syndrome, Sensory nerve conduction velocity, Median proper palmar digital nerve

(carpal tunnel syndrome, CTS)
가 : 가
1:3 40~60 가
58% CTS
가

CTS 가
CTS 가
가
가
가
CTS
1 (), 2 (), 3 ()
(bar electrode)
가 (median proper palmar digital nerve, MPPDN)

1,2
3,4
5,6
7,8

Address for correspondence
Dong Kuck Lee, M.D.
Department of Neurology, School of Medicine Catholic University,
3056-6 Daemyung 4-dong, Nam-gu, Daegu, 705-718, Korea
Tel: +82-53-650-4261 Fax: +82-53-654-9786
E-mail : dklee@cu.ac.kr

1. 2000 2003 CTS 6 , 가 MPPDN 가 가 .

47 53 90 26 69 52 , 20 msec, 50 μ V, 100 μ sec 2 Hz

가 26 32 Medelec Sapphire

가 3 가

Belly tendon 가 4.0 msec (one-way ANOVA test)

가 35 m/sec . CTS 1, 2, 3 가

. 1 2 가 (multiple comparison; Duncan) SAS 8.01 p

Phalen 가 . 3 , Tinel <0.05

가

1 25 4 1, 2, 3 가

21 51.7 . 2 31 33.7 \pm 1.3, 33.3

1 30 51, 3 8 \pm 0.9, 34.9 \pm 2.4 m/sec 23.8 \pm 1.0,

1 , 7 50.5 .

Table 1. Mean values and standard deviation of sensory nerve conduction velocity (SNCV) of each (digit 1, 2, 3, 4) median proper palmar digital nerves in group 1, 2, 3

Digit	Clinical grading	Number of patients	mean of SNCV	standard deviation of SNCV	P-value
Thumb (SNCV1)	1	33	33.724	7.710	.817
	2	47	33.325	6.788	
	3	10	34.920	7.835	
Sum		90	33.648	7.186	
Index (SNCV2)	1	33	23.854	6.215	.001
	2	47	19.176	4.530	
	3	10	20.400	6.243	
Sum		90	21.027	5.766	
Middle (SNCV3)	1	33	21.793	5.115	.015
	2	47	18.785	4.565	
	3	10	18.260	4.701	
Sum		90	19.830	4.970	
Ring (SNCV4)	1	33	23.245	7.226	.044
	2	47	19.916	6.100	
	3	10	18.640	6.124	
Sum		90	20.995	6.702	

19.1±0.6, 20.4±1.9 m/sec, 21.7±0.8,
 18.7±0.6, 18.2±1.4 m/sec, 23.2±1.2,
 19.9±0.8, 18.6±1.9 m/sec (Table 1, Fig. 1).
 가

가
 14,15

가

0.817

가

CTS

가 가 16-18 Cioni 16

MPPDN
 MPPDN

CTS

가 가 3 2 가 1
 가 가 가

Chang¹⁹ 가 가

가 가 가
 가 가 가
 가 가 가
 가 가 가

가 3 cm
 가

(MPPDN)
 가
 CTS

10,11

Kwak Lee²⁰
 가 CTS

MPPDN
 CTS

12,13 CTS

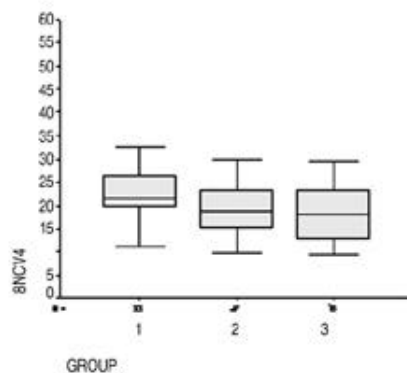
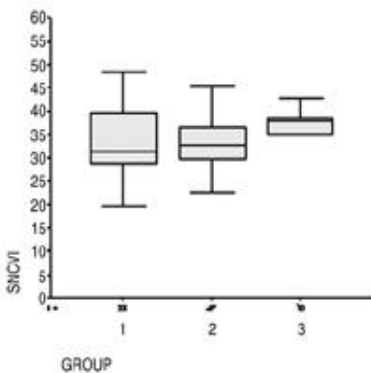
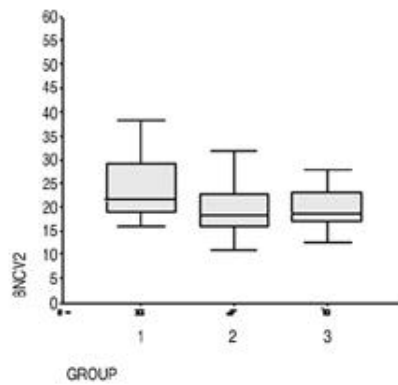
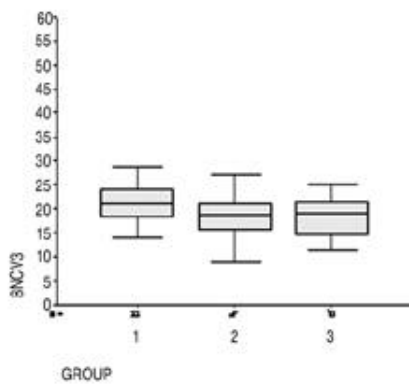


Figure 1. Mean values and standard deviation of sensory nerve conduction velocity (SNCV) of each (digit 1, 2, 3, 4) median proper palmar digital nerves in group 1, 2, 3.

1, 2, 3
가 MPPDN
가 CTS
(1)
가 2 3 (2, 3)
가
가
가
Macdpnell²¹ 가 가
가 CTS 가
Kothari²² CTS 가 가
, Pauda²³ CTS
Terzis²⁴ 가 가
CTS
가 MPPDN
CTS
CTS
가 CTS 가
MPPDN 가
가
3 2 1 2, 3
가
CTS 가
가 2 3
가 가 3
가
Kaneko²⁵
Morimoto⁷ Yamano⁸
가 가
가
가
MPPDN

가 CTS
가 가
가 CTS

REFERENCES

- Phalen GS. The carpal tunnel syndrome; seventeen years experience in diagnosis and treatment of 654 hands. *J Bone Joint Surg* 1966;8:211-228.
- Frederick HA, Carter PO, Litter JW. Injection injuries to the median and ulnar nerve at the wrist. *J Hand Surg* 1992;17:645-647.
- Tachibana S, Nagano A, Okinaga S. The role of electrophysiological study in carpal tunnel syndrome. *J Jpn Soc Surg Hand* 1986;8:873-80.
- Ogura T, Akiyo N, Kubo T, Kira Y. The relationship between nerve conduction study and clinical grading of carpal tunnel syndrome. *J Orthop Surg* 2003;11(2):190-193.
- Nakanishi T, Tamaki M, Mizusawa H, Akatsuka T, Kinoshita T. An experimental study for analyzing nerve conduction velocity. *Electroencephalogr Clin Neurophysiol* 1986;63:484-7.
- Seror P. The axonal carpal tunnel syndrome. *Electo-encephalogr Clin Neurophysiol* 1996;101:197-200.
- Morimoto K, Ishigara A, Tanaka H, Miyazaki M. Clinical and electrophysiological studies in carpal tunnel syndrome. *Rinsho Byori* 1987;35:347-50.
- Yamano S, Okunobou Y, Inoue T. Follow up studies of carpal tunnel syndrome with reduced conduction velocity of proximal segment. *Cent Jpn J Orthop Traumat* 1992;29:1767-73.
- Dawson DM, Hallett M, Millender LH. *Entrapment neuropathies*. 3th ed. Philadelphia: Lippincott-Raven. 1999;20-21.
- Dyson M, Bannister LH. Neurology. In: Williams PL, Warwick R. *Gray's anatomy*. 36th ed. W.B: Saunders company. 1980;1098-1100.
- Netter FH. Musculoskeletal system. In: Brass A, Dingle RV. *The CIBA collection of medical illustrations*. vol 8. CIBA pharmaceutical company, Division of CIBA-GEIGY corporation. 1983;57-59.
- Seror P. Nerve conduction studies after treatment for carpal tunnel syndrome. *J Hand Surg* 1992;7:41-645.
- Stolp-Smith KA, Pascoe MK, Ogburn PL. Carpal tunnel syndrome in pregnancy : frequency, severity and prognosis. *Arch Phys Med Rehabil* 1998;9:1285-1287.
- Shurr DG, Blair WF, Bassett G. Electromyographic change after carpal tunnel release. *J Hand Surg* 1986;11:876-80.
- Chilagenhauff RE, Glassuer FE. Pre and postoperative electromyographic evaluations in the carpal tunnel syn-

- drome. *J Neurosurg* 1971;35:314-9.
16. Cioni R, Passero S, Paradiso C, Giannini F, Battistini N, Rushworth G. Diagnostic specificity of sensory and motor nerve conduction variable in early detection of carpal tunnel syndrome. *J Neurol* 1989;236:208-213.
 17. Sunderland S. Anatomical feature of nerve trunks in relation to nerve injury and nerve repair. *Clin Neurosurg* 1970;4:38-62.
 18. Sunderland S. The nerve lesion in the carpal tunnel syndrome. *J Neurol Neurosurg Psychiatry* 1976;39:615-626.
 19. Chang CW. Comparison of sensory nerve conduction in the palmar cutaneous branch and first digital branch of the median nerve; a new diagnostic method for carpal tunnel syndrome. *Muscle Nerve* 1991;14:1173-1176.
 20. Kwak KH, Lee DK. Sensory nerve conduction velocity of median proper palmar nerve recorded by bar electrode. *J Korean Society Clini Neurophysiol* 2000;2:21-26.
 21. Macdonell RAL, Schwartz MS, Swash M. Carpal tunnel syndrome which finger should be tested? An analysis of sensory conduction in digital branches of the median nerve. *Muscle Nerve* 1990;13:601-606.
 22. Kothari MJ, Rutkove SB, Caress JB, Inchey, Logigian EL, Preston DC. Comparison of digital sensory studies in patients with carpal tunnel syndrome. *Muscle Nerve* 1995;18:1272-1276.
 23. Pauda L, Lo Monaco M, Valente EM, Tonali PA. A useful electrophysiologic parameter for diagnosis of carpal tunnel syndrome. *Muscle Nerve* 1996;19:48-53.
 24. Terzis S, Paschalis C, Papapetropoulos T. Early diagnosis of carpal tunnel syndrome: Comparison of sensory conduction studies of four fingers. *Muscle Nerve* 1998;21:1543-1545.
 25. Kaneko K, Miyamoto T, Nakahara Y, Kawai S, Huchigami Y. Electrophysiological staging of carpal tunnel syndrome. *Cent Jpn J Orthop Traumat* 1993;36:1471-2.