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## Sensory Nerve Conduction Velocity of Median Proper Palmar Digital Nerve Recorded by Bar Electrode

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### - Abstract -

**Background** : There has been few electrophysiologic studies in median proper palmar digital nerve(PPDN). Bar electrode may be a useful tool to evaluate the pathophysiologic state of the distal peripheral nerves.

**Objectives** : To evaluate sensory nerve conduction velocities(NCVs) of median PPDNs in normal controls and carpal tunnel syndrome(CTS) patients by bar electrode, and clarify the usefulness of the bar electrode.

**Methods** : We checked NCV of each median PPDN of thumb(D1), index(D2) and middle finger(D3) in normal controls(68 hands) and CTS patients(95 hands) by bar electrode. The each mean NCV of both groups were compared to find the correlation between them.

**Results** : The mean NCV of each median PPDN in control group were  $38.7 \pm 4.2$ (D1),  $32.0 \pm 4.6$ (D2),  $34.2 \pm 4.4$ (D3) m/sec, and in CTS group were  $35.3 \pm 8.9$ (D1),  $20.2 \pm 5.2$ (D2),  $20.2 \pm 5.1$ (D3) m/sec order-ly. There were significant differences between mean NCV of each finger in control group( $p=0.0001$ ), but not between each left and right finger( $p > 0.05$ ). The differences between each mean NCV of control and CTS were significant in all 3 fingers( $p=0.0014, 0.0000, 0.0000$ ).

**Conclusion** : Bar electrode is a useful tool to evaluate the pathophysiologic state of the median PPDNs in normal controls and CTS patients.

**Key Words** : Median proper palmar digital nerve, Carpal tunnel syndrome, Bar electrode

	ve)	(terminal
	branch)	가
	(median common palmar digital nerve)	
	가	(median prop-
가	(median palmar digital ner-	er palmar digital nerve; MPPDN)

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가 , ,  
 .  
 가<sup>1,2</sup>  
 가 가  
 가 MPPDN  
 가 MPPDN  
 가  
 electrode)  
 가  
 가  
 (carpal tunnel syndrome; CTS)  
 MPPDN  
 가

2.  
 (D1), (D2) (D3) MPPDN  
 (active electrode) 가  
 (proximal interphalangeal joint)  
 (reference electrode)  
 (distal interphalangeal joint)  
 (sweep velocity) 20msec, (sensitiv-  
 ity) 50 $\mu$ V, (stimulus rate) 2Hz,  
 (stimulus duration) 100  $\mu$ sec  
 (Fig. 1).  
 3cm  
 가  
 (negative deflection) (positive deflection)  
 (Fig. 2).  
 (conduction time)  
 (negative peak) (positive peak)  
 Fig. 3 2 3  
 4.

(sensory nerve conduction velocity;  
 SNCV)  
 $SNCV(m/sec) = 30mm(\text{distance between two recording sites}) / \text{conduction time between two recording sites}(msec)$

1.  
 1998 3 1999 3  
 ,  
 CTS  
 36  
 ( 19 , 17 ) 68  
 , CTS 78 ( 28 , 50 )  
 95  
 CTS  
 ,  
 가  
 가 4.0msec  
 가 35m/sec  
 20 60  
 , 37.1  $\pm$  4.2  
 46.3  $\pm$  3.1  
 가

(D4) MPPDN  
 가 가  
<sup>1,2</sup>  
 (1) D1, D2, D3 MPPDN  
 가? (2)  
 가? (3) D1, D2, D3 가  
 가 가? (4) 가  
 가  
 가 MPPDN  
 가 가  
 Medelec Sapphire Premiere  
 가  
 SAS , p < 0.05  
 가

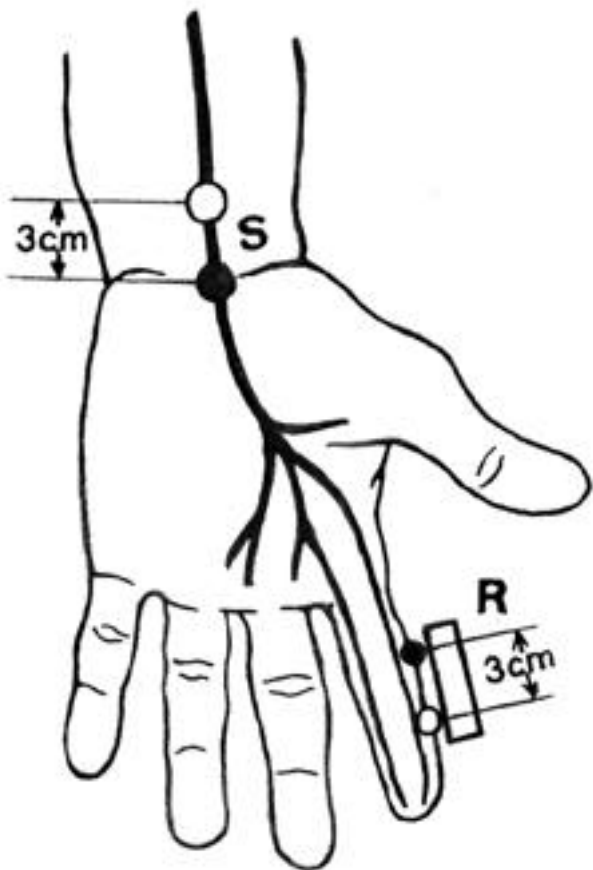


Figure 1. Diagram of innervation of the median proper palmar digital nerves and position of stimulating and recording electrodes of the bar electrode.

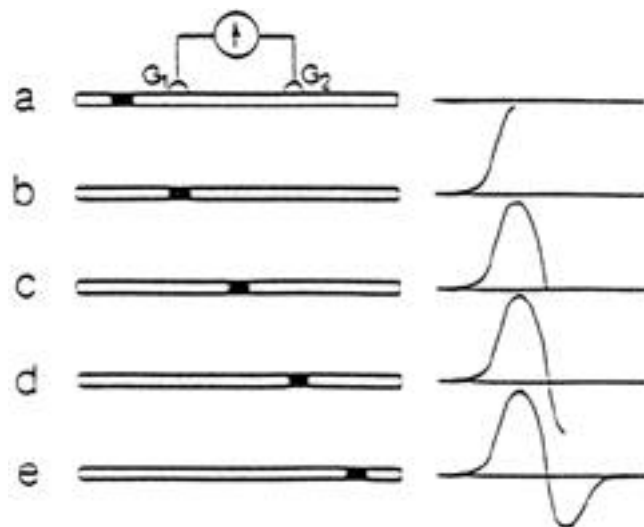
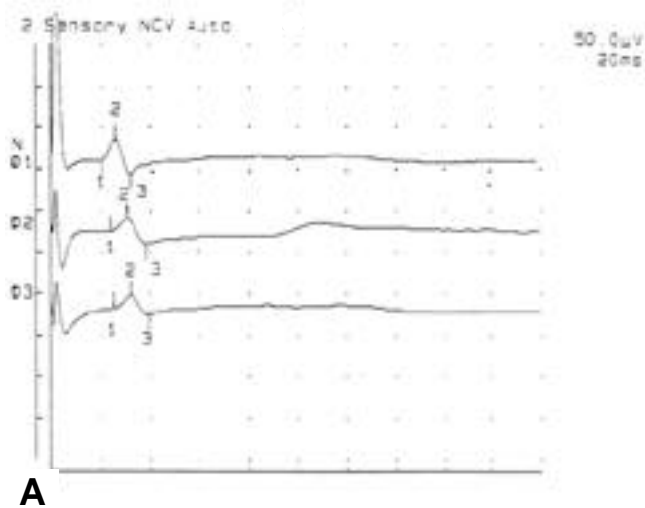


Figure 2. Diaphasic recording of an action potential represented by the shaded area. As the impulse propagates from left to right in the top series, the two electrodes see no potential difference in a, c, e. Relative to the reference electrode ( $G_2$ ), the active electrode ( $G_1$ ) becomes negative in b and positive in d, resulting in a biphasic potential.

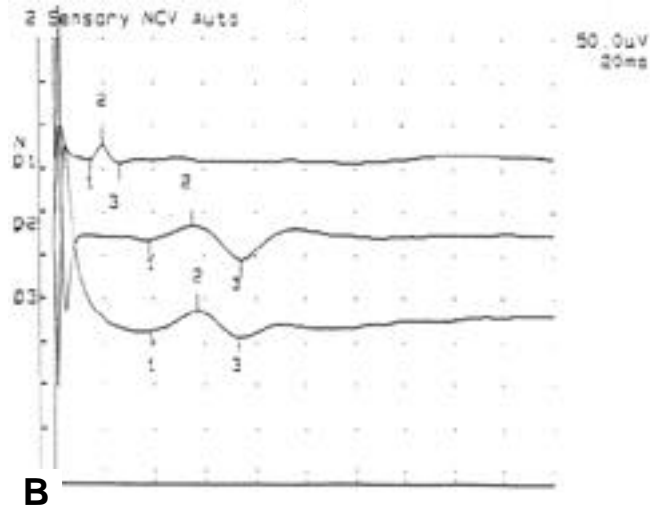


Figure 3. Sensory nerve action potential recorded by bar electrode in the digit 1 (D1), digit 2 (D2), digit 3 (D3) of the normal control (A) and the carpal tunnel syndrome patient (B).

가  
MPPDN 38.7±  
4.2, 32.0±4.6, 34.2±4.4 m/sec ,  
가  
(Table 1). 가 MPPDN  
가 가 t-test  
가 가 가 p<0.05  
가 가  
가 가  
가 가  
가 가  
가 가  
가 가  
가 가

**Table 1.** Mean values of sensory nerve conduction velocity (SNCV) of median proper palmar digital nerves(MPPDNs) in digit 1(D1), digit 2(D2), digit 3(D3) of the normal controls and the carpal tunnel syndrome(CTS) patients

	D1(m/sec)	D2(m/sec)	D3(m/sec)
SNCV of MPPDN			
normal	38.7 ± 4.2	32.0 ± 4.6	34.2 ± 4.4
CTS	35.3 ± 8.9	20.2 ± 5.2	20.2 ± 5.1
p-value	0.0014	0.0000	0.0000

가 D1, D2, D3 MPPDN p > 0.05  
 가 D1, D2, D3 MPPDN 35.3 ± 8.9, 20.2 ± 5.2, 20.2 ± 5.1 m/sec  
 test 가 p < 0.05 t-  
 가 MPPDN (Table 1).  
 가 (MPPDN)  
 가  
 (lumbrical muscle)  
 가  
 가  
 가 1,2  
 MPPDN (puncture) (laceration) 가  
 가  
 가 Mavor 3 가  
 (ring electrode)  
 가 5 가  
 가  
 가 7 (ring electrode) (initial negative deflection)  
 가 MPPDN  
 가 MPPDN  
 가 MPPDN  
 가 MPPDN  
 가 Uncini 6 MPPDN  
 가

(active recording electrode)  
 (reference recording electrode)  
 3cm  
 MPPDN  
 가 (negative deflection) (positive deflection)  
 MPPDN  
 가 3cm 가  
 가 (small myelinated)  
 MPPDN (unmyelinated)  
 MPPDN (nerve funicle)  
 가 가 MPPDN  
 8-13 CTS MPPDN MPPDN  
 가  
 가 6,13 CTS  
 가 (intrafunicular anoxia)  
 8,12,14 CTS MPPDN  
 가  
 MPPDN 가 CTS  
 MPPDN 가 가 Chang 15 가 (palmar cutaneous nerve)  
 가 가 가 CTS  
 가 가 CTS  
 가 Cioni 8  
 MPPDN MPPDN  
 가 CTS  
 가 Uncini 6

가 : 가

가 가 가 가 , CTS 가 가

가 가 가 CTS 가

MPPDN CTS MPPDN 가

가 가

가 가 D1, D2, D3 가 가

가 가 D1, D2, D3 가 가

가 , CTS MPPDN , 가

MPPDN MPPDN

가 CTS , CTS CTS

가 CTS가

ficity) 가 (sensitivity) 가 (speci-

CTS MPPDN

1. MPPDN 38.7  
 $\pm 4.2(D1)$ ,  $32.0 \pm 4.6(D2)$ ,  $34.2 \pm 4.4(D3)$  m/sec  
 가 .

2. MPPDN 가 .

3. CTS MPPDN

가

$35.3 \pm 8.9(D1)$ ,  $20.2 \pm 5.2(D2)$ ,  $20.2 \pm 5.1(D3)$  m/sec  
 가 .

CTS MPPDN 가

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