

## Palmar Digital Neuropathy with Anatomical Variation of Median Nerve: Usefulness of Orthodromic Study

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### Introduction

As median nerve passes under flexor retinaculum, it enlarges and divides into two portions: lateral and medial. The medial portion divides into two common palmar digital branches after passing through transverse carpal ligament. Then they each split into two proper digital nerves for the adjoining sides of 2nd to 4th digits. Selective exploration of palmar digital nerves with a nerve conduction study has long been difficult because of technical issues. In our study, we report a rare variation in the course of common palmar digital nerves of a median nerve and its neuropathy. We also describe how we figured out the neuropathy with an orthodromic sensory conduction study.

### Case Report

A 33-year-old woman with a complaint of sensory change of a left hand visited us on August 30th, 2017. She had received a bilateral open carpal tunnel release operation on May 24th. She had felt a relief of previous symptom on thumb and index finger immediately after the surgery, but tingling sensation and hypoesthesia on left middle and ring fingers remained and got worse. On a physical examination, hypoesthesia was noted on the ulnar side of middle finger and the radial side of ring finger on a palmar side of a left hand. Also, Tinel's sign was positive on the proximal wrist crease tapping. An electrodiagnostic study was performed on September 5th, 2017. The left median compound muscle action potential was within normal range. The left antidromic median sensory response with a middle finger recording was of low amplitude compared to the sound side. The orthodromically conducted sensory responses were unobtainable at the wrist with the ulnar side of middle finger and radial side of ring finger stimulations. The patient was then diagnosed with a complete left median sensory neuropathy of palmar digital nerve supplying ulnar side of middle finger and radial side of ring finger. Ultrasonography was performed on the same day. No abnormal findings including nerve swelling or impingement was found neither at the palm nor at the carpal tunnel. But at the distal wrist crease, compression and swelling of the median nerve were shown with fluid collection. The patient underwent a re-operation of open left carpal tunnel release on October 26th, 2017. Interestingly, a branching site of common digital nerves of the median nerve was identified not at a palm, but at a far proximal site around a distal wrist crease. In addition, a traumatic neuroma was identified on diverging site. The neuroma excision and direct end to end neurorrhaphy were done. After the surgery, the pain on the left middle and ring fingers was reduced by 70 percent.

### Discussion

We report a patient with a palmar digital neuropathy with a rare anatomical variation of median nerve. Also, the usefulness of an orthodromic sensory conduction study was

clarified to eliminate the volume conducted response or co-activation of nearby nerves in the patient with selective involvement of palmar digital nerve.

Table 1. Motor and Sensory Nerve Conduction Study Data

Side	Sensory Nerve	Stimulation site	Recording site	Latency (ms)		Amplitude (uV)	Distance (cm)
				Onset	Peak		
Left	Median	wrist	thumb	2.0	2.5	56	10
		wrist	II digit	2.5	3.3	41	14
		wrist	III digit	2.5	3.1	<b>19*</b>	14
		III digit (radial side)	wrist	3.2	3.5	19	14
		III digit (ulnar side)	wrist			<b>NR*</b>	
		IV digit (radial side)	wrist			<b>NR*</b>	
	Ulnar	wrist	IV digit (ulnar side)	2.3	3.2	37	14
	wrist	V digit	2.3	3.1	54	14	
Right	Median	wrist	III digit	2.8	3.4	40	14
		III digit (radial side)	wrist	3.1	3.6	18	14
		III digit (ulnar side)	wrist	3.1	3.7	18	14
		IV digit (radial side)	wrist	3.2	3.6	17	14
	Ulnar	wrist	IV digit (ulnar side)	2.2	2.9	29	14

NR: no response

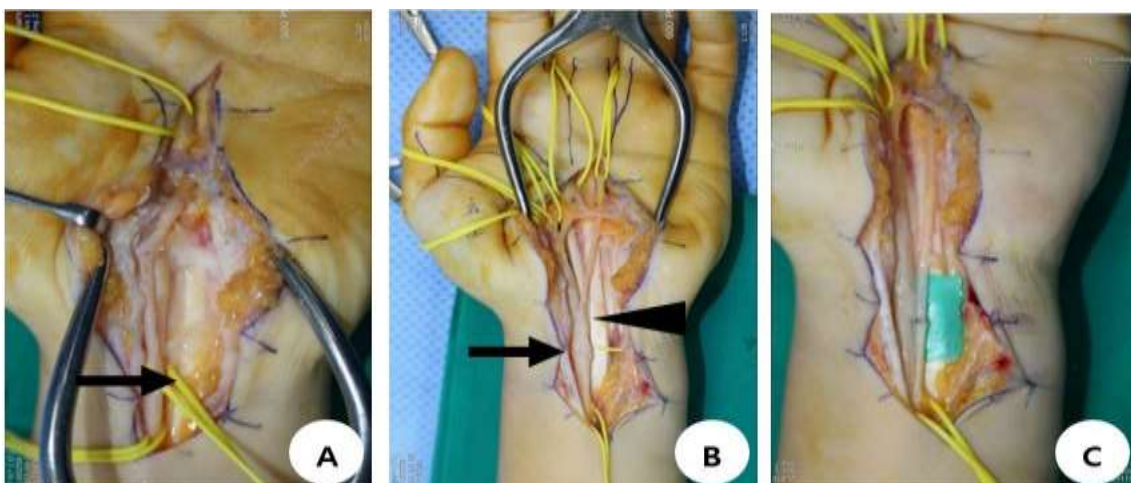


Fig. 1. Operative findings (A) The open carpal tunnel release and median nerve exploration was done on the left side. The left median nerve (arrow) was identified, and severe tenosynovitis around flexor tendons was found. (B) The divergence of common palmar digital nerves (arrowhead) was found around a distal wrist crease level. A traumatic neuroma (0.5\*0.5cm) (arrow) was identified on just proximal to diverging site. (C) Neuroma excision and microscope-assisted direct the end to end neurorrhaphy were done.

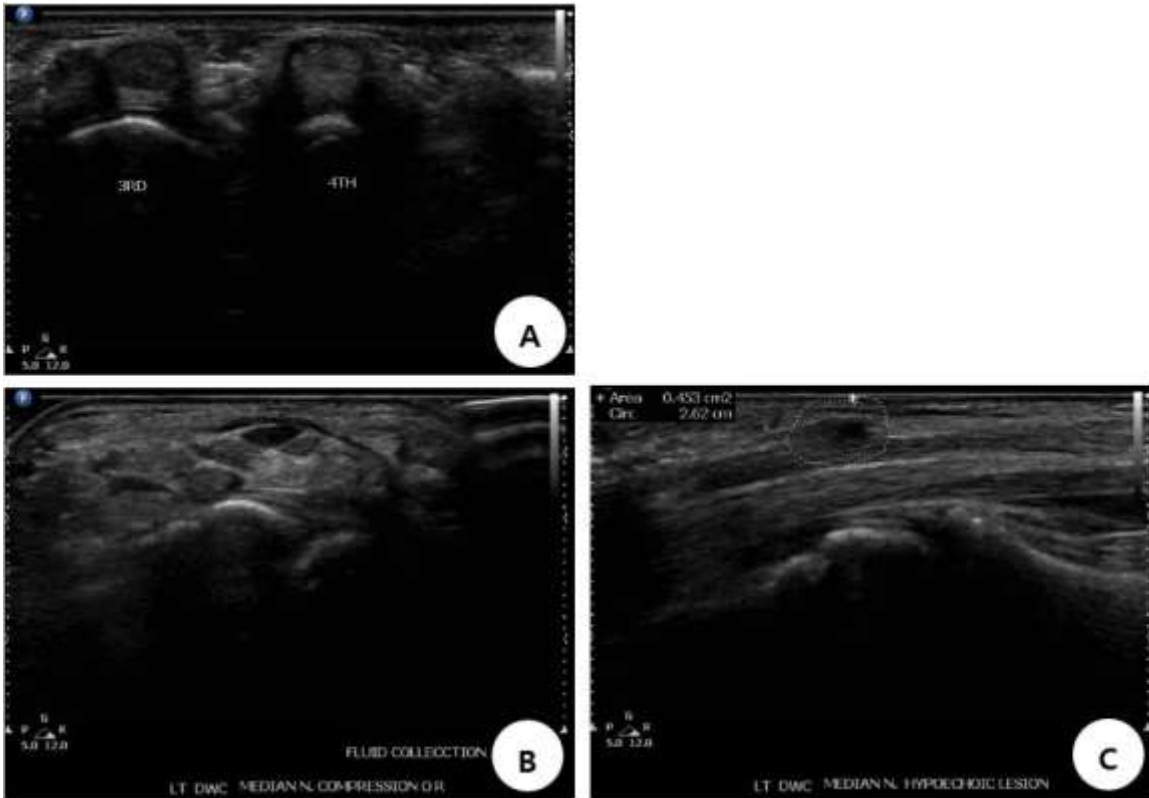


Fig. 2. Ultrasonography (A) No abnormal finding was noted in the palm of left hand including a 3rd web space. (B) The left median nerve was compressed at the distal wrist crease level. (C) A swelling of the left median nerve and fluid collection around it were noted at the distal wrist crease level.