

Compression Neuropathy of the Motor Fibers of the Median Nerve at Wrist Level

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Selective electrophysiological involvement of median motor fibers is rare in carpal tunnel syndrome. We report a patient with compression neuropathy of the median nerve who presented with isolated motor signs and symptoms without macroscopic evidence of compressive pathologies. [*J Chin Med Assoc* 2009;72(5):268–270]

Key Words: carpal tunnel syndrome, decompression, median motor fibers, median nerve, surgery

Introduction

Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy. Common electrophysiological findings are slowing of impulse conduction localized to the carpal tunnel segment.¹

In CTS, selective electrophysiologic involvement of median motor fibers is rare, and the incidence varies from 0.6% to 1.2%, depending on the sensitivity of the test used.

Herein, we report the clinical features, electrophysiologic findings, management and results of a patient with compression neuropathy of the median nerve who presented with isolated motor signs and symptoms.

Case Report

A 58-year-old man presented with a 3-month history of decreased strength in the dominant left thumb. Clinical examination revealed no hypotrophy of the left thenar crease. The strength in thumb abduction and opposition was markedly reduced. He had no sensory symptoms or signs.

Key pinch strength was 2.5 kg by pinch meter. The examination showed no sensory disturbance to light touch and no difference in 2-point discrimination between the thumb and the other fingers. There was no Tinel's sign in the wrist, and Phalen's and reverse Phalen's tests were negative. Radiographs of the wrist and hand showed no abnormalities. Electrophysiologic studies found that the left median nerve sensory study was normal. An abnormal motor response was recorded with prolonged distal motor latency (7.1 ms) and reduced compound muscular action potential (CMAP) (4.1 mV) in the median nerve to the abductor pollicis brevis. Electromyography test of the abductor pollicis brevis displayed fibrillation and greatly reduced recruitment. The studies demonstrated that there was a selective compression of the terminal median nerve motor branch to the abductor pollicis brevis.

In this patient, motor and sensory ulnar conduction velocities and amplitudes of CMAP and sensory nerve action potential were normal. Electromyography test excluded differential diagnoses (Tables 1 and 2).

The standard incision for carpal tunnel release, between the third and fourth ray, was used for exploration. The flexor retinaculum was divided longitudinally in order to decompress the median nerve.



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Table 1. Preoperative distal motor latency and CMAP values from the abductor pollicis brevis after stimulation at the wrist

Nerve/site	Latency (ms)	CMAP (mV)
Left median/APB		
Wrist	7.1	4.1
Right median/APB		
Wrist	3.7	8.3
Left ulnar/ADM		
Wrist	3.1	5.8
Right ulnar/ADM		
Wrist	3.2	5.6

CMAP = compound muscular action potential; APB = abductor pollicis brevis; ADM = abductor digiti minimi.

Table 2. Postoperative distal motor latency and CMAP values from the abductor pollicis brevis after stimulation at the wrist (12 weeks after surgery)

Nerve/site	Latency (ms)	CMAP (mV)
Left median/APB		
Wrist	3.5	7.9
Right median/APB		
Wrist	3.49	8.3
Left ulnar/ADM		
Wrist	3.31	5.8
Right ulnar/ADM		
Wrist	3.28	5.9

CMAP = compound muscular action potential; APB = abductor pollicis brevis; ADM = abductor digiti minimi.

Further exploration to the junction of the motor branch did not reveal macroscopic evidence of anatomic variations of the median nerve (Figure 1). Ten weeks after surgery, the patient had no difficulty in using his left hand, and key pinch strength had improved to 6.5 kg.

Electromyography test performed 12 weeks after surgery revealed a reduction in distal motor latency (3.5 ms) and an increase in CMAP (7.9 mV).

Discussion

Isolated motor branch involvement is described in the literature. Ganglion cyst is frequently reported to be an etiologic factor in isolated motor branch compression.²⁻⁶

Bennet and Crouch⁷ reviewed 8 cases of concomitant or independent compression of the recurrent motor branch of the median nerve and found that

**Figure 1.** Intraoperative photograph.

this entity appears to exist in the presence of carpal tunnel symptomatology or as independent compression. Evans et al reported a case in which anatomy of the thenar eminence predisposed the median motor branch to extrinsic compression.⁸

It is generally accepted that median nerve sensory conduction is more sensitive than motor conduction in the electrodiagnosis of CTS. Therefore, motor segmental conduction can be more abnormal than sensory.⁹ Repaci et al² found that 31 patients out of 2,727 with CTS were affected by prolonged median distal motor latency with normal sensory conduction velocity. In mild to moderate CTS, motor fibers are more commonly affected than was originally thought.¹⁰

In our case, although the clinical and electrophysiologic findings suggested a selective compression of the thenar branch, we did not find either selective compression of the thenar branch or anatomic course variation of the median nerve and its branch in the carpal tunnel at surgery. The early effects of compression of the nerve in CTS are not uniform, and the anteromedially and anterolaterally situated fasciculi appear to be more susceptible compared to fibers located more centrally.^{11,12} However, the lack of macroscopic evidence does not necessarily imply the absence of microscopic evidence.

Prevalent or exclusive motor fibers involved in CTS may be related to the intraneural topography of motor fibers before the emergence of the recurrent motor thenar branch. The motor fibers are located beneath the transverse ligament, in the most volar-radial quadrant. In a previous anatomic dissection study, Mackinnon and Dellon¹³ found that the motor thenar branch arose in 60% of cases from the extreme radial part of the nerve; in 18%, the motor branch arose from a location between the extreme radial volar and the central aspect of the nerve.¹⁴⁻¹⁶ This may explain why, in some cases,

the motor fibers to the abductor pollicis brevis, located anterolaterally in the median nerve, can be injured first.

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