

# A Day in the EMG Laboratory: Case Studies of 10 Patients with Different Clinical Problems

Rachel DiTrapani, MD, Devon I. Rubin, MD\*

## KEYWORDS

- Electromyography • Nerve conduction studies • Algorithm
- Neuromuscular disorders

Other articles in this issue have reviewed basic concepts of nerve conduction studies (NCSs) and needle electromyography (EMG), and have detailed the electrodiagnostic features and approaches that are used to evaluate different types of neuromuscular disorders. This article discusses 10 representative case vignettes that may be encountered during a day in the EMG laboratory, which demonstrate the approaches used in our EMG laboratory to evaluate patients presenting with specific symptoms and a variety of suspected neuromuscular conditions. Each case presents a brief description of the patient's symptoms and clinical findings, suggests the suspected localization or diagnosis that was considered based on the clinical features before the performance of the electrodiagnostic study, and then presents the NCS and needle EMG data that were actually gathered from that patient. Comments and instructive electrodiagnostic considerations as they relate to each case are discussed at the end of the case. Although it would be uncommon to encounter all of these patients in a single day in the EMG laboratory, it would surely be an interesting and educational workday.

## CASE 1. A HOSPITAL VOLUNTEER WITH HAND NUMBNESS

### *Clinical History*

A 79-year-old woman, who worked as a volunteer at the information desk of our hospital, complained of numbness and paresthesias in her right thumb and index finger. Her symptoms were constant, but worse when she would drive to work in the morning and during the night when she was trying to sleep. She noted that rubbing

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Department of Neurology, Mayo Clinic, 4500 San Pablo Road, Jacksonville, FL 32224, USA

\* Corresponding author.

E-mail address: [rubin.devon@mayo.edu](mailto:rubin.devon@mayo.edu)

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or shaking her hand improved the symptoms slightly. She denied weakness; however, she reported dropping objects that she was holding in her hand on occasion. She also reported some achiness of her shoulder and entire arm, and occasional mild neck stiffness. She did not experience any similar symptoms in her left hand.

**Physical Examination**

The pertinent neurologic examination findings were decreased sensation to pinprick on the flexor surface of the thumb, index, and middle fingers. There was no weakness or atrophy noted in the right thenar or other arm muscles. Reflexes were normal and symmetric in her upper extremities.

**Differential Diagnosis**

The clinical features were most suspicious for a right median neuropathy at the wrist (carpal tunnel syndrome [CTS]). However, other localizations that may present with similar features and should be considered include a C6-C7 radiculopathy (especially given some neck and arm discomfort), a proximal median neuropathy, or, less likely, a brachial plexopathy.

**Electrodiagnostic Summary and Interpretation**

The electrodiagnostic studies (NCSs and needle examination) are shown in **Tables 1** and **2**. The NCSs demonstrated prolonged right median motor and sensory distal latencies and a low median sensory amplitude with a mildly slowed conduction velocity. Needle EMG was normal. The findings indicate a moderately severe right median neuropathy at the wrist (CTS).

**Case Comment**

This case demonstrates typical features of a median neuropathy at the wrist, such as occurs in CTS, with conduction slowing identified in motor and sensory fibers in the distal median nerve across the wrist. In this case, motor NCSs were performed first and because the median motor fibers demonstrated a prolonged distal latency, the antidromic sensory techniques were selected for the sensory studies. Had the median motor NCSs been completely normal, the orthodromic (palmar) sensory studies or other comparison studies (median–radial to thumb or median–ulnar to ring finger) would have been performed to increase the sensitivity of identifying a very mild distal median neuropathy. The needle examination consisted of evaluation of muscles supplied by the median nerve as well as those innervated by the C5 through T1 roots to exclude a superimposed cervical radiculopathy (although a cervical radiculopathy at any level would not affect the median sensory NCSs). Given the normal median

| Table 1<br>Case 1: nerve conduction studies |                              |    |     |                   |    |     |                        |     |      |                        |      |      |
|---------------------------------------------|------------------------------|----|-----|-------------------|----|-----|------------------------|-----|------|------------------------|------|------|
| Stimulate (Record)                          | Amplitude<br>(mV or $\mu$ V) |    |     | Velocity<br>(m/s) |    |     | Distal Latency<br>(ms) |     |      | F-Wave Latency<br>(ms) |      |      |
|                                             | R                            | L  | NL  | R                 | L  | NL  | R                      | L   | NL   | R                      | L    | Est  |
| Ulnar, m (hypothenar)                       | 12.7                         |    | >6  | 55                |    | >51 | 3.0                    |     | <3.6 | 27                     |      | 24.8 |
| Ulnar, s anti (fifth)                       | 33                           |    | >10 | 60                |    | >54 | 3.0                    |     | <3.1 |                        |      |      |
| Median, m (thenar)                          | 7.7                          | 8  | >4  | 51                | 58 | >48 | 5.1                    | 3.4 | <4.5 | 27.3                   | 28.0 | 28.6 |
| Median, s anti (index)                      | 10                           | 20 | >15 | 51                | 66 | >56 | 4.6                    | 3.0 | <3.6 |                        |      |      |

Abbreviations: Est, estimate; NL, normal values.

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