The Role of the “EMG”

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\frac{\text{Distance (cm)}}{\text{Proxi. lat.} - \text{Dist. lat. (ms)}} = \text{CV (m/s)}
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Key Terms

- Distal latency
- Conduction velocity
- Muscle membrane instability
“NOW I WANT YOU TO RELAX COMPLETELY!”
Who performs EMGs?

- PM&R
- PTs
- Neurologists
  - General, Clinical Neurophysiology, Neuromuscular
What can we evaluate?

- The peripheral nervous system
  - Nerves, Muscles
  - If a normal test, may indicate
    - Problem is central nervous system
    - Not neurologic
    - Error in EMG interpretation
“Hey Doc! My hand is tingling...”
Clinical Presentation

- Numbness/Tingling
- Nocturnal symptoms
- Wrist pain
- Exacerbated by overuse
- Most common in dominant hand, but is commonly bilateral
- Grip weakness
RED Flags

- Radicular neck pain
- Acute onset
- Severe pain
- Weakness or sensory symptoms outside the hand
Medial to the shoulder blade
Area of numbness and pain (shaded)

- Median nerve
- Ligament
- Tendon sheath
- Tendons
- Cross-section

- Tendons
- Median nerve
- Ligament
- Carpal bones

Carpal tunnel

Carpal tunnel
NCS/EMG

- Sensory nerve conduction
- Motor nerve conduction
- Needle EMG
NCS/EMG

- Prolonged distal latency or absent SNAPs
- Slowing at the wrist in CMAPs
- +/- decreased amplitude of CMAPs
- Muscle membrane instability isolated to median innervated muscles OF THE HAND only (sparing median muscles of forearm)
Diagnostic criteria for CTS (median mononeuropathy at the wrist)

- Mild
- Moderate
- Severe
Mild CTS
- Slow SNAP
- Normal CMAP
- Needle EMG normal

Moderate CTS
- Absent SNAP
- Slow CMAP
- Mild abnormal needle EMG

Severe CTS
- Absent SNAP
- Absent or severely slow CMAP
- Abnormal needle EMG
Treatment options

- Conservative

- Surgical

Transverse carpal ligament

Inflamed median nerve

Released median nerve

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“Hey Doc! I’ve been wearing that wrist brace you gave me and my hand is still tingling...”
Clinical Presentation

- Numbness/Tingling in 4th and 5th digits
- Nocturnal symptoms
- Elbow pain
- Exacerbated by leaning on elbow, over-bending, lifting, overuse
- Most common in non-dominant hand, but may be bilateral
- >> Grip weakness
RED Flags

- Radicular neck/shoulder pain
- Painless weakness
- Acute onset
Area found to be scarred down and compressed

Ulnar nerve found to be hourglass compressed and discolored for about 1.5cm

Course of ulnar nerve through the arm to the small and ring fingers of the hand

Ulnar nerve
Cubital tunnel

Medial humeral epicondyle
Ulnar nerve
Cubital tunnel

Left Elbow Cubital Tunnel Syndrome
Compression of the ulnar nerve as it dives under the medial humeral epicondyle, and the muscles and tendons of the forearm flexors
NCS/EMG

- Sensory nerve conduction
- Motor nerve conduction
- Needle EMG
NCS/EMG

- Normal or mildly abnormal SNAPs
- Focal slowing or conduction block across the elbow
- Muscle membrane instability isolated to ulnar innervated muscles only
Treatment options

- Conservative
- Surgical
When to send for EMG?

1. Failed conservative trial
2. Diagnostic ambiguity
3. RED flag symptoms
“Ahhh, my aching back...”
Clinical Presentation

- Pain and paresthesias radiating in the distribution of nerve root
- May involve weakness or motor dysfunction
- Dermatomes and myotomes*
RED Flag symptoms

- Acute onset
- Rapid weakness
- Bilateral LE involvement
- Dense sensory loss or focal muscle weakness
- Bowel or bladder dysfunction
  - incontinence
  - incomplete emptying and/or
  - retention
NCS/EMG

- Sensory nerve conductions
- Motor nerve conductions
- Needle EMG
EMG/NCS

- Normal SNAPs
- Variable CMAPs
- Prolonged F waves
- Muscle membrane instability in myotomal level corresponding with level of radiculopathy
  - Including paraspinal muscles
Treatment options

- Conservative
- Surgical
Skip the scan. Start with physical therapy for low back pain.
Limitations of the EMG study

- If study is too early, may be falsely normal
- Difficult to localize to a single lumbar level
What’s the bottom line?

1. Conservative treatment first if clinical diagnosis is clear.
2. Order the test, we are happy to objectively clarify the issue/symptom 😊
Thank you!