Is a *clinical* interpretation (beyond the EDX interpretation) helpful or harmful to the referring physician?

Devon I. Rubin, MD  
Professor of Neurology  
Mayo Clinic  
Jacksonville, Florida
Case

- 65 year old man
- Referred by family MD
- 2 years of weakness, CK 650 u/L.

Your clinical examination:
- moderate proximal arm and leg weakness, severe weakness in finger flexors and quadriceps

EMG Findings:
- Normal NCS
- Fibrillation potentials and short duration, polyphasic MUPs with rapid recruitment, most severely in the weakest muscle.
What would the wording of your EMG Report final interpretation?

1. There is evidence of a myopathy. **Clinical correlation is advised.**

2. There is evidence of a myopathy, **characterized by muscle fiber necrosis, splitting or vacuolar changes.**

3. There is evidence of a myopathy. **In the context of the patient’s clinical features, the findings raise the possibility of inclusion body myositis.**

4. There is evidence of a myopathy. **Given the clinical features, the findings raise the possibility of IBM.** A muscle biopsy of the quadriceps would be recommended. If the findings are consistent with another inflammatory myopathy (e.g. polymyositis), treatment options would include prednisone, IVIg, or methotrexate.
How much information should we be providing the referring MD in our EMG Reports?
Information that an EMG report should provide.

AANEM Practice Topic: Reporting the results of needle EMG and NCS: an educational report. 2005

- Confirmation of a suspected clinical diagnosis (and exclude alternative diagnoses)
- Localization
- Define the pathophysiology
- Define the chronicity and severity
5. Option. Provide the probable clinical diagnosis, if indicated, based on a synthesis of the clinical information and the electrophysiological results (e.g., a clinical diagnosis of carpal tunnel syndrome).

“Option” or Requirement?

Clinical EMG = the practice of neuromuscular and electrodiagnostic medicine and should ALWAYS consider and incorporate the clinical and electrodiagnostic features!
**Automatic EMG Reports**

**RIGHT MEDIAN MOTOR F-WAVE**
- Latency: 29.6 milliseconds (normal)

**LEFT MEDIAN MOTOR F-WAVE**
- Latency: 29.6 milliseconds (normal)

**BILATERAL LOWER EXTREMITY MOTOR NERVE CONDUCTION STUDIES**

**RIGHT COMMON PERONEAL MOTOR NERVE**
- Proximal latency: 11.8 milliseconds (normal)
- Amplitude: 3.83 millivolts (normal)
- Distal latency: 4.56 milliseconds (normal)
- Amplitude: 5.17 millivolts (normal)
- Conduction velocity: 43.8 m/sec. knee to ankle (normal)

**RIGHT PERONEAL MOTOR ACROSS THE KNEE**
- Proximal latency: 13.7 milliseconds (normal)
- Amplitude: 3.5 millivolts (normal)
- Conduction velocity: 46.1 m/sec. (normal)

**LEFT COMMON PERONEAL MOTOR NERVE**
- Proximal latency: 12.5 milliseconds (normal)
- Amplitude: 2.37 millivolts (low normal)
- Distal latency: 4.98 milliseconds (normal)
- Amplitude: 3.67 millivolts (normal)
- Conduction velocity: 44.3 m/sec. knee to ankle (normal)

**LEFT PERONEAL MOTOR ACROSS THE KNEE**
- Proximal latency: 14.1 milliseconds (normal)
- Amplitude: 2.83 millivolts (low normal)
- Conduction velocity: 45.0 m/sec. (normal)

**RIGHT POSTERIOR TibIAL MOTOR NERVE**
- Proximal latency: 13.7 milliseconds (normal)
- Amplitude: 5.5 millivolts (normal)
- Distal latency: 4.86 milliseconds (normal)
- Amplitude: 10.7 millivolts (normal)

**Conduction velocity**
- 49.0 m/sec. knee to ankle (normal)

**LEFT POSTERIOR TIBIAL MOTOR NERVE**
- Proximal latency: 13.9 milliseconds (normal)
- Amplitude: 4.83 millivolts (normal)
- Distal latency: 4.2 milliseconds (normal)
- Amplitude: 10.7 millivolts (normal)
- Conduction velocity: 43.5 m/sec. knee to ankle (normal)

**RIGHT SUPERFICIAL PERONEAL SENSORY**
- Latency: 3.28 milliseconds (normal)
- Amplitude: 9.58 microvolts (normal)

**LEFT SUPERFICIAL PERONEAL SENSORY**
- Latency: 3.3 milliseconds (normal)
- Amplitude: 16.7 microvolts (normal)

**RIGHT SURAL SENSORY**
- Latency: 3.52 milliseconds (prolonged)
- Amplitude: 18.3 microvolts (normal)

**LEFT SURAL SENSORY**
- Latency: 3.54 milliseconds (prolonged)
- Amplitude: 21.7 microvolts (normal)

**RIGHT H-REFLEX**
- Latency: 30.1 milliseconds (normal)

**LEFT H-REFLEX**
- Latency: 29.3 milliseconds (normal)

**RIGHT MEDIAL PLANTAR**
- Latency: 4.86 milliseconds (prolonged)
- Amplitude: 10.7 millivolts (normal)

**LEFT MEDIAL PLANTAR**
- Latency: 4.2 milliseconds (normal)
- Amplitude: 10.7 millivolts (normal)

**RIGHT LATERAL PLANTAR**
- Latency: 4.92 milliseconds (prolonged)
- Amplitude: 10.2 millivolts (normal)

**LEFT LATERAL PLANTAR**
- Latency: 4.2 milliseconds (normal)
- Amplitude: 8.5 millivolts (normal)

---

**Electrodiagnostic Interpretation:**

The above Nerve Conduction/EMG can support the diagnosis of:

1. Left median sensory distal neuropathy.
2. Bilateral ulnar sensory distal neuropathy.
4. Mild right side posterior tarsal tunnel syndrome.
Why is a clinical diagnosis not always incorporated?

1. Not **taking the time** to review key elements of the patient’s symptoms or examination (rely on the referral information)

2. Focus **only** on the electrical findings

3. Not comfortable “**taking responsibility**” (“Clinical correlation is advised”)

(“Clinical correlation is not advised”??)
• 72 year old woman with diabetes and 1 year of progressive imbalance and lower extremity numbness
• EMG referral: “Assessment of peripheral neuropathy”

Summary: Peroneal (fibular) and tibial motor, and sural sensory, NCS of the right lower extremity were normal. Concentric needle examination of the lower extremity muscles was normal.

Interpretation: Normal EMG. There is no evidence of a large fiber peripheral neuropathy. A small fiber neuropathy cannot be excluded on the basis of a normal EMG.
Exam:

- Bilateral weakness in foot dorsiflexion, hamstrings, iliopsoas
- Lower extremity hyperreflexia, Babinski signs, and spasticity
- Needle EMG of anterior tibialis: involuntary dorsiflexion and hip flexion
Summary: Peroneal (fibular) and tibial motor, and sural sensory, NCS of the right lower extremity were normal. Concentric needle examination of the lower extremity muscles was normal. The patient demonstrated a “triple flexion” response during needle insertion in the lower extremities. Physical examination showed hyperactive lower limb reflexes, sustained bilateral ankle clonus, and bilateral extensor plantar responses.

Interpretation: Normal EMG. Although this study does not find evidence of a peripheral process, the clinical findings are those of a central nervous system disorder affecting upper motor neuron pathways. Neurologic consultation is recommended. Results discussed by telephone with Dr. X.

- Focus is not purely on the electrophysiology.
- Attention paid to obvious clinical signs and symptoms at the time of the examination
- Electrophysiological findings are presented - the emphasis is on clinical observations which re-direct the neurologic evaluation
Back to the . . .
Which EMG report is more helpful?

“The study demonstrates evidence of a diffuse myopathy characterized by muscle fiber necrosis, splitting, or vacuolar changes. Clinical correlation is advised.”

“The study demonstrates evidence of a diffuse myopathy. The pattern of findings, in the context of the patient’s distribution of clinical weakness, is most suggestive of inclusion body myositis.”
Our job as “clinical electromyographers”

To provide as much information as possible to assist the referring physician in the diagnosis and, ultimately, management of the patient
Why a **clinical**-electrophysiologic interpretation is **HELPFUL**

- Many referring MDs are not neurologists/physiatrists (not neuromuscular specialists)
- Better assists the referring physician in making the diagnosis
- May spare the patients unnecessary tests (more cost-effective)
Why a clinical-electrophysiologic interpretation may be “HARMFUL”

- We may not be sure of the actual diagnosis, based on the EMG
  - Weakness with patchy neurogenic findings

- We may identify findings unrelated to the patient’s symptoms
  - e.g. mild CTS in a patient with diffuse body pain

- Do we obligate referring MDs to perform further investigations/treatment?
Clinical-electrophysiologic considerations

- **Myopathies** (myotonic dystrophy, FSH dystrophy)
- **Motor neuron diseases** (ALS, Spinobulbar muscular atrophy, polio)
- **Neuropathies** (MMN-CB, CIDP, MAG neuropathy/POEMS)
- Non-specific pain
- Paresthesias
- Patchy or borderline neurogenic findings
- Proximal myopathies without clear distinguishing features
Should we include evaluation and treatment recommendations in the EMG report?

**Interpretation:**
The EMG is compatible with (1) a mild, chronic, active right C6 radiculopathy and (2) a mild right median neuropathy at the wrist, such as seen with “carpal tunnel syndrome”.

**Clinical Correlation:**
Further evaluation with an MRI of the cervical spine may be useful.

Carpal tunnel syndrome may be associated with diabetes, hypothyroidism, amyloidosis. **Screening for these conditions with HgA1C, glucose tolerance test, TSH, serum immune-electrophoresis might be considered.**

This patient may benefit from a treatment trial with wrist splints. If symptoms do not improve within 4 weeks, steroid injections into the carpal tunnel or, as the very last resort, carpal tunnel release may be considered.
Should we include **evaluation** and **treatment recommendations** in the EMG report?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Referring MDs may have limited experience in evaluating neuromuscular disorders</td>
<td>• EMG is an “electrodiagnostic consultation”, <strong>NOT</strong> a complete neurologic consultation</td>
</tr>
<tr>
<td>• More cost-effective and timely assessment for the patient</td>
<td>• Medical-legal implications</td>
</tr>
<tr>
<td>• May lead to earlier interventions (?) Improved outcome</td>
<td>• Recommendations above and beyond the diagnostic impression should be withheld or discussed with the referring MD verbally.</td>
</tr>
</tbody>
</table>
Is a clinical interpretation (beyond the EDX interpretation) helpful or harmful to the referring physician?

Answer: “IT DEPENDS” . . . . on:

- Who is the referring physician?
- The clinical acumen and confidence of the electromyographer
- Performing complete neurologic consultation at same time?