



AMERICAN COLLEGE OF
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CERVICAL AND THORACIC SPINE DISORDERS

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Electromyography

Electromyography (EMG) is a physiological test that assesses the function of the motor unit (including the neuron's anterior horn cell, its axon, the neuromuscular junctions and muscle fibers it supplies). (372, 373) It differs from surface EMG, which is discussed below. EMG technically refers to the needle electromyogram and the term "EMG" is usually misused as a euphemism for an electrodiagnostic exam that includes both needle EMG and peripheral nerve conduction testing. Among spine patients, EMG has been used primarily to evaluate radiculopathy. (374)

1. *Recommendation: EMG with Upper Extremity Symptoms*

Electrodiagnostic studies, which must include needle EMG, are recommended where a CT or MRI is equivocal and there is ongoing upper extremity pain that raise questions about whether there may be a neurological compromise that may be identifiable (i.e., upper extremity symptoms consistent with radiculopathy, spinal stenosis, peripheral neuropathy, etc.). Also, may be helpful for evaluation of chronicity and/or aggravation of a pre-existing problem.

Indications – Failure to resolve or plateau of suspected radicular pain without resolution after waiting 4 to 6 weeks (to provide for sufficient time to develop EMG abnormalities as well as time for conservative treatment to resolve the problems), equivocal imaging findings such as CT or MRI, and suspicion by history and physical examination that a neurologic condition other than radiculopathy may be present instead of, or in addition to radiculopathy.

Harms – Medicalization or worsening of otherwise benign spine condition. Pain. Hematoma. Misinterpretation if not done by an appropriately trained person.

Benefits – Diagnosis of neurological compromise.

Strength of Evidence – **Recommended, Insufficient Evidence (I)**

Level of Confidence – **High**

2. *Recommendation: EMG without Upper Extremity Symptoms*

Electrodiagnostic studies are not recommended for patients with acute, subacute, or chronic neck pain who do not have significant upper extremity pain or numbness.

Strength of Evidence – **Not Recommended, Insufficient Evidence (I)**

Level of Confidence – **Moderate**

Rationale for Recommendations

Needle EMG may help determine if radiculopathy and/or spinal stenosis is present, and can help address acuity. (375) EMG requires full knowledge of the anatomy and precise innervation of each muscle to properly perform and interpret the test results. Needle EMG also requires the skills of an experienced physician who can reliably spot abnormal motor potentials and recruitment patterns. Nerve conduction studies are usually normal in radiculopathy (except, for example, for motor nerve amplitude loss in muscles innervated by the involved nerve root in more severe radiculopathy). Nerve conduction studies rule out other causes for upper limb symptoms (generalized peripheral neuropathy, pronator syndrome, etc.) that can mimic radiculopathy.

An abnormal EMG that persists after anatomic resorption of the herniation(376) and that correlates with the patient's symptoms is generally considered proof the symptoms are due to radiculopathy. Thus, the EMG study documents that management for chronic neuropathic pain appears appropriate.

As imaging studies (especially CT and MRI) have progressed, the need for EMG has declined. However, EMG remains helpful in certain situations. These include ongoing pain suspected to be of neurological origin, but without clear neurological compromise on imaging study. EMG can then be used to attempt to rule in/out a physiologically important neurological compromise. An abnormal study confirming radiculopathy permits a diagnosis of neuropathic pain (helping with pain management decisions). This test should not be performed in the first month unless there is a desire to document pre-existing neurological compromise, as it requires time (generally at least 3 weeks) to develop the needle EMG abnormalities. EMG is minimally invasive, and has no long-term adverse effects (although it is somewhat painful), and it is costly. To result in reliable measures, it must be performed by a practitioner well skilled in the appropriate anatomy and testing procedures. Post-operative changes may persist in normal individuals without clinical significance, thus also requiring careful interpretation.

Evidence for the Use of Electromyography

There are no quality studies regarding the use of electromyography.

We searched PubMed and Google Scholar without limits on publication dates. We used the following search terms: Surface Electromyography, sEMG, neck pain [MESH] and Diagnostic to find 99 articles. We reviewed 99 articles and included 0 articles.

Surface Electromyography

Surface electromyography (sEMG) has been used to diagnose spine pain, especially in the lumbar spine (377-393) and involves the recording of summated muscle electrical activity by skin electrodes (such as those used in an electrocardiogram or EKG). Unlike traditional needle EMG (see above), no needle is used to explore specific portions of specific muscles for motor unit potentials.

1. Recommendation: Surface EMG for Diagnosing Cervical or Thoracic Pain

Surface EMG is not recommended to diagnose cervical or thoracic pain.

Strength of Evidence – Not Recommended, Insufficient Evidence (I)

Level of Confidence – High

Rationale for Recommendation

There are no quality studies demonstrating that use of surface EMG results in improved diagnosis or evaluation of patients with cervical or thoracic pain. Available studies in the lumbar spine have methodological weaknesses, including poor descriptions of patients, small sample sizes, types of machine, electrode placement, and analysis of the output making outcomes difficult to compare across studies.(379, 383, 389, 393, 394)

The American Association of Neuromuscular and Electrodiagnostic Medicine's position is that there are no clinical indications for the use of sEMG in the diagnosis and treatment of disorders of nerve and muscle, although potential future uses are possible.(395, 396) Surface EMG is not invasive, has few adverse events, is moderately costly, but has a lack of quality evidence of benefits for the clinical evaluation or treatment of spine disorders and thus is not recommended.