The Value of Electrodiagnostic Studies in Predicting Treatment Outcomes for Patients with Spine Pathologies

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KEYWORDS

• Electromyography • Radiculopathy • Diagnosis • Outcome • Spine • Low back pain • Epidural steroid injection • Therapy

KEY POINTS

- Electrodiagnostics have a high specificity, but a low sensitivity for radiculopathy.
- In certain cases, electrodiagnostics can be a valuable tool to aid in the diagnostic algorithm.
- The diagnostic confidence in the test results are predicated on the prevalence of the suspected pathology.

INTRODUCTION

Spine pathology represents a major public health concern, with estimates showing prevalence of 70% to 90% of adults experiencing these maladies at some point in their lives.[1,2] The number of patient visits related to spine pain has continually increased, as has the number of opioid prescriptions written for them and the number of referrals to specialists.[3] For the subset of patients with radicular pain, studies have shown benefit from several different treatments, including physical therapy (PT),[4,5] epidural steroid injections (ESIs),[6–12] and surgical interventions.

Disclosures: The authors have no relevant financial disclosures.

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Phys Med Rehabil Clin N Am ■ (2018) ■–■
https://doi.org/10.1016/j.pmr.2018.06.004
1047-9651/18/Published by Elsevier Inc.

Given current public health trends, better management strategies for back pain are necessary, but with the wide array of interventions available, it is often difficult to predict individual patient response to treatment. This dilemma is confounded by the lack of a single gold standard for the diagnosis of radiculopathy. The diagnosis of radiculopathy is generally made based on clinical impression gathered from the history and physical. This can become problematic, as multiple non–spine pain generators have been shown to radiate in the arm[13] or leg,[14,15] which could mimic radicular pain. Use of imaging is often problematic because of the high number of asymptomatic abnormals. Electrodiagnostic testing often adds useful information to help reach a diagnosis.[13–19]

Electrodiagnostics (EDX) are physiologic tests for assessing radiculopathies, and the electromyography (EMG) portion is the single most important technique for assessing denervation.[19,20] EDX may provide valuable information regarding both the localization and the presence of axonal nerve damage at the nerve root. EDX can also help evaluate for other conditions that can mimic radiculopathy[21]

EDX for radiculopathy represents a high specificity, low sensitivity test.[22] Thus, it serves as a good way to confirm a diagnosis, but is not a good screening test due to the low sensitivity. However, the question does arise, could EDX be useful in predicting which patients might respond better to a given treatment plan? This article explores current evidence for the predictive value of EDX for the effectiveness of PT, ESIs, and surgery in patients with cervical and lumbosacral radiculopathy. Then, those data are used to give examples of when EDX testing may be of clinical utility based on disease prevalence and the diagnostic confidence of a given test combined with current treatment paradigms.

PHYSICAL THERAPY AND OTHER CONSERVATIVE CARE

Only one study to date has evaluated the utility of EDX to predict outcomes from physical therapy. Savage and colleagues[23] studied patients with “sciatica” who underwent EDX performed by a physical therapist. One weakness of the study is that the criteria for a positive EMG was denervation in limb muscles and/or isolated abnormal findings in the paraspinal muscles. Diagnosing radiculopathy by paraspinal abnormality alone is not a standard EDX criterion for radiculopathy.[24] Despite this, patients who met the EMG criteria for radiculopathy demonstrated better improvement in low back–related disability outcomes after physical therapy compared with those with normal EDX.[23] There has not been a study on EDX predicting response to chiropractic care, acupuncture, massage, or oral medications. This may be because of the relatively little evidence for benefit of these conditions for radiculopathy.[25]

EPIDURAL STEROID INJECTIONS

The role of EDX in predicting response to ESIs has been studied more extensively than its role in predicting outcomes from other treatments.

Fish and colleagues[26] retrospectively studied the predictive value of EDX on outcomes from lumbar transforaminal ESIs performed on 39 patients. EDX were deemed positive based on findings of denervation and/or reinnervation. In this small study, the investigators showed a slightly greater improvement in Oswestry Disability Index in the EMG-positive group, no difference was seen in pain scores between the EMG-positive (18 patients) and EMG-negative (21 patients) groups.

Marchetti and colleagues[27] retrospectively studied the predictive value of EMG in patients with mixed diagnoses who received an ESI (either transforaminal, interlaminar, or caudal). EMG findings were considered positive based on denervation or reinnervation. They found no significant differences in leg and back pain improvements