Carpal tunnel syndrome, compression of the median nerve within the confines of the carpal tunnel, is the most common peripheral compression neuropathy. By definition, a syndrome is a constellation of signs and symptoms. Carpal tunnel syndrome is defined by numbness and tingling in the median nerve distribution, nocturnal exacerbation of symptoms, and positive provocative testing (eg, Phalen test, Tinel’s sign, compression test). For most patients, the presence of the classic signs and symptoms should be adequate for the diagnosis. However, many physicians order confirmatory testing and some insurance companies require the confirmatory testing prior to approving surgical treatment. The most commonly ordered test is a combination of nerve conduction studies and electromyography. As pressure increases on physicians to control health care–associated costs and implement evidence-based medicine into clinical practice, we must critically analyze the data regarding nerve conduction studies. Should they be considered the “gold standard” for the diagnosis of carpal tunnel syndrome, or are they unnecessary studies that increase costs and delay treatment?

Anecdotaly, confirmatory testing is ordered for several reasons. First, sometimes the diagnosis is unclear. Symptoms may not be classic and the diagnosis could be clouded by associated diagnoses such as cervical radiculopathy, peripheral neuropathy, or other systemic conditions. Interestingly, little data exist regarding the results of nerve conduction studies for patients with these confounding diagnoses. Most studies specifically exclude these groups of patients. One would expect that conduction across the wrist would be “normal” for patients without compression of the median nerve within the carpal tunnel, but this has not been well established in the literature. I feel that it is unwise to make this assumption without evidence. Atroshi et al found that 23 (18%) of 125 patients without clinical signs and symptoms of carpal tunnel syndrome had electrodagnostic studies showing median neuropathy at the wrist. The authors excluded patients with systemic disease. If 18% of patients with no systemic disease have abnormal results on electrodagnostic studies, it seems reasonable that patients with systemic disease would have at least that proportion, and possibly a higher proportion, of abnormal results. Witt et al found that 25% of the patients in their series with clinical signs and symptoms of carpal tunnel syndrome had normal results on nerve conduction studies. Based on clinical diagnosis, that means that 1 in 4 patients would have had a false-negative result. I concede that some of these patients could have had very mild carpal tunnel syndrome that was undetectable using nerve conduction studies or that the clinical diagnosis was incorrect. However, ignoring the high false-negative and false-positive rates of electrodagnostic testing is akin to sticking our heads in the sand and pretending it is not a problem. None of us would accept a 25% false-positive rate for magnetic resonance imaging when diagnosing rotator cuff tears.

Second, obtaining an objective number prior to surgery would be desirable, particularly if patients do not improve after surgery.

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The author has no relevant financial relationships to disclose.

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or symptoms become worse. In these instances, the testing could be repeated and the numbers compared. If the conduction velocity is improving, the patients may be counseled that the surgery was “successful” and that persistent symptoms may require more time to resolve or that there may be another reason for them. If the postsurgery conduction velocity is unchanged or worse than the presurgery conduction velocity, revision surgery may be offered to the patient. Although this strategy appears to be sound, postsurgical changes in nerve conduction velocity after carpal tunnel release is, again, poorly studied. Because most patients with carpal tunnel syndrome improve after carpal tunnel release, our inability to convince these patients to submit to an uncomfortable test when asymptomatic leads to low follow-up rates in these studies. My personal experience is that the results of nerve conduction studies often do not return to normal despite the resolution of symptoms.

Third, some insurance payers have required electrodiagnostic testing prior to carpal tunnel release. This stance is problematic from the perspectives discussed above (ie, the relatively high rate of false-positive and false-negative results). On the basis of this requirement, we would be undertaking 25% of patients (false negative) and possibly overtreating 20% of patients (false positive). In addition, performing confirmatory electrodiagnostic testing prior to surgery has not been shown to improve outcomes. Glowacki et al4 compared the outcomes of open carpal tunnel release in two patient cohorts—one with a clinical diagnosis of carpal tunnel syndrome confirmed using nerve conduction studies, and one not undergoing nerve conduction studies prior to surgery. Outcomes were similar between the groups, and the authors concluded that routine nerve conduction studies prior to surgery were not indicated.

Nerve conduction studies have been regarded as strong confirmatory tests due to their high specificity. Diagnostic tests with a high specificity have a low number of false-positive results, a desirable quality when wanting to avoid surgery for an incorrect diagnosis. However, the cut-off values used for a positive diagnosis may vary between laboratories, and the specificity of any individual test is rather low. As with clinical examination, the specificity increases as more tests are employed. Numerous sensory and motor latencies over variable distances are used to measure nerve conduction. In addition, relative sensory latencies between the median and ulnar or radial nerves is considered an effective test.4 My personal view is that if 10 different diagnostic tests or variations of the diagnostic test are needed to arrive at the diagnosis, then either the tests are suboptimal or we are missing the boat.

Whenever I present these viewpoints, I am often roundly criticized by proponents of electrodiagnostic testing. I believe the criticisms are based in several broad categories. The first, and probably most influential, is financial. Numerous physicians have a large financial incentive to perform confirmatory electrodiagnostic testing. For some physicians, it may be a large proportion of their income. I can certainly understand why there would be stiff resistance to someone suggesting that electrodiagnostic testing not be routinely ordered. As a hand surgeon, if someone started talking about carpal tunnel release being an outdated procedure with minimal benefit and suggested that I stop performing it, I would obviously be upset. Second, electrodiagnostic testing has become entrenched in the diagnostic algorithm at many institutions. It is always difficult to change the culture, and many physicians order the tests because that is how they were trained or because “that is how it is done” at their institution. Third, it is my belief that many physicians do not know or do not have the time to understand the current literature and make evidence-based decisions based on it. Literally hundreds of articles about electrodiagnostic testing have been published during several decades. Based on the frequent use and study of electrodiagnostic testing, its “superiority” has become dogma in medicine. My interpretation of the literature as a whole is that despite the hundreds of studies that have been performed, a lack of “evidence” that electrodiagnostic testing should be the diagnostic modality of choice for carpal tunnel syndrome remains. The sheer volume of research on electrodiagnostic testing tends to drown out research on alternative diagnostic methods and pushes proponents of alternative methods into a “fringe” category.

It is my firm belief that in 30 years we are going to look back on electrodiagnostic testing for carpal tunnel syndrome and shake our heads in disbelief. We are going to say, “Can you believe that they used to repeatedly shock people and then stick needles in their muscles to diagnose carpal tunnel syndrome?” Electrodiagnostic testing is going to be compared with bloodletting and other medical misadventures of the past. The body of literature simply does not support its routine use for carpal tunnel syndrome. Those who continue to argue otherwise are well intentioned but are biased and not seeing the evidence clearly. There are certainly reasonable scenarios in cases of unclear diagnosis, and electrodiagnostic testing will continue to identify unexpected diagnoses among a limited number of individuals. It is my hope that this editorial will stir a respectful and passionate discussion about the evidence regarding the routine use of electrodiagnostic testing for carpal tunnel syndrome and that it will motivate the medical community to perform high-quality research that will give further evidence to the discussion.

REFERENCES