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Clinical Faceoff: Routine Electrodiagnostic Testing is Not Helpful in the Management of Carpal Tunnel Syndrome

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There is substantial variation in the way that electrodiagnostic tests are used, and continued debate regarding the value of such tests (Table 1). In this Clinical Faceoff,

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I ask two expert hand surgeons to debate the issue of routine electrodiagnostic testing prior to surgery for carpal tunnel syndrome. Dr. Brent Graham is Chief of the Orthopaedic Division at the Toronto Western Hospital, will be the next Editor-In-Chief of the *Journal of Hand Surgery, American Volume*, and creator of a diagnostic tool for carpal tunnel syndrome based on symptoms and signs alone. Dr. Warren Hammert is Professor of Orthopaedic and Plastic Surgery at the University of Rochester.

Dr. David C. Ring: *Carpal tunnel syndrome seems to have gotten confused with the illness construction “repetitive strain injury” as that iatrogenic epidemic raged in the late 1980s. Most patients and many doctors still conceive of carpal tunnel syndrome as “pain with typing.” Given the propensity of humans to get caught up in compelling misconceptions, do we need an objective measure of pathophysiology to optimize treatment of idiopathic median neuropathy at the carpal tunnel?*

Dr. Brent Graham: Electrodiagnostic testing is objective insofar as neither patient nor doctor can easily influence

the result. But patients want relief of symptoms, not a better number on a test. They are seeking treatment for carpal tunnel syndrome (symptoms related to median nerve compression at the wrist), not treatment of electrodiagnostic abnormalities in the median nerve. If we seek a measure of carpal tunnel syndrome that is reliable and valid, easily obtained, painless, and inexpensive, interview and physical examination seem adequate. The Carpal Tunnel Syndrome-6 (CTS-6) is a grading of six symptoms and signs (as used by expert clinicians) that generates a probability that a given patient has carpal tunnel syndrome. Understanding the diagnosis in probabilistic terms is more realistic and provides an important discussion point with the patient.

Dr. Warren Hammert: There are substantial misconceptions about carpal tunnel syndrome. It is important to emphasize that the symptoms most consistent with carpal tunnel syndrome are intermittent numbness and tingling in the median nerve distribution that can wake a person from sleep. Patients often have some symptoms and signs that are consistent with carpal tunnel

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Table 1. Views from clinical faceoff experts on carpal tunnel syndrome and the value of electrodiagnostic tests

	Dr. Graham	Dr. Hammert
Is the surgeon's job to treat bothersome symptoms or prevent nerve damage?	Symptoms	Neuropathy
Does untreated median neuropathy at the carpal tunnel always progress to nerve damage?	No	Yes
Is atrophy and constant numbness from severe median neuropathy permanent and unresponsive to surgery?	No	Yes
Which is worse: Surgery for symptoms without pathophysiology or surgery for pathophysiology without symptoms?	Surgery for pathophysiology without symptoms is worse	Surgery for symptoms without pathophysiology is worse
Can the average surgeon manage the normal human tendency to misperception, biases, and stress contagion and account for it?	Yes	No
Can the average patient understand the normal human tendency to misperception and bias and account for it?	Yes	No
If surgeons cannot agree on the best role for electrodiagnostic testing, should the patient help decide?	No	Yes

syndrome and some that are not (no night time symptoms, numbness throughout the entire hand rather than only median nerve distribution, pain with activity). There are also patients with a specific motivation (such as a lawsuit or insurance dispute) who may be savvy enough to report characteristic symptoms and signs but have normal electrodiagnostic tests. Using symptoms and signs alone (the CTS-6) may contribute to misdiagnosis in these and other scenarios.

Dr. Ring: *Electrodiagnostic testing is uncommonly at odds with a hand surgeon's diagnosis based on symptoms and signs. How can we justify the expense, discomfort, and inconvenience associated with routine electrodiagnostic testing?*

Dr. Hammert: Electrodiagnostic testing has several benefits including: (1) Identifying other sources of compression such as radiculopathy or underlying sensory polyneuropathy; (2) documenting severe electrodiagnostic abnormalities to help counsel patients with severe median neuropathy at the carpal tunnel. Patients can expect immediate improvement in night-time symptoms, but delayed and often incomplete resolution of constant numbness, atrophy, or weakness. Surgery will protect the existing nerve function, but in my opinion, there is likely some permanent change to the nerve; (3) avoiding unnecessary and unhelpful repeat surgery by using electrodiagnostic tests to (a) explain to patients who are dissatisfied with the

results of carpal tunnel release—no matter how well-informed prior to surgery—why some symptoms have not improved and (b) confirm complete release of the transverse retinacular ligament with postoperative tests that demonstrate no progression or slight improvement several months after surgery; and (4) assisting the management of patients with magnification or obfuscation of symptoms and signs related to distress, secondary gain, or other psychosocial factors.

Dr. Graham: Incomplete relief of symptoms can be related to an incomplete release, an element of Wallerian degeneration (that, in my opinion, will eventually improve after a complete release), or an incorrect diagnosis. I believe symptoms and

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signs are adequate to distinguish from among these possibilities. Incorrect diagnosis is unlikely if symptoms have improved to a certain extent after release. Progression of a Tinel's sign verifies improvement. Electrodiagnostic testing is not helpful because abnormalities persist after surgery whether or not the release is complete.

Dr. Ring: *It is commonplace for hand surgeons to see patients who are dissatisfied with the result of carpal tunnel release performed by another surgeon. Some of these patients had surgery for pain and still have pain. A larger proportion of these patients had severe carpal tunnel syndrome and are disappointed that they are still numb. It is not uncommon for numbness, inability to palmarly abduct the thumb, and atrophy to seem new after surgery. We surgeons notice this in our own patients even after coaching and education. Patients and surgeons can become convinced that the nerve was not completely released, or even worse, that it was injured. Given this human potential for misperception and misinterpretation, do we need a baseline objective electrophysiological nerve test done within a few months of surgery in order to avoid unnecessary and unhelpful repeat surgery by documenting the extent of the initial pathophysiology and being able to document that it is no worse after surgery?*

Dr. Graham: The idea that electrodiagnostic function of the median nerve is always normal if the nerve is not compressed, and returns to normal after compression is relieved by surgery, may not be accurate. For instance, it is commonly accepted that some patients with carpal tunnel syndrome have normal electrodiagnostic tests. Furthermore, electrodiagnostic testing is frequently (perhaps always) abnormal even when the symptoms have resolved. As a result, there is little reason to accept the idea that median nerve function, as reflected by electrodiagnostic testing, and symptoms of carpal tunnel syndrome are consistently well correlated. When the preoperative symptoms can be related to median nerve compression, lack of improvement is due to either incomplete release or severe compression with Wallerian degeneration in the median nerve. Severe compression might improve and progression of a Tinel's sign distally in time can be observed. If the preoperative symptoms do not seem consistent with median nerve compression (regardless of the result of preoperative electrodiagnostic testing) the lack of improvement is most likely due to incorrect diagnosis.

Dr. Hammert: It is helpful if the prior surgeon has informed the patient that constant numbness may not resolve or even improve after successful surgery.

Even so, some patients are dissatisfied. I find electrodiagnostic testing helpful in this scenario. While nerve conduction does not normalize following successful surgery, it often improves or at least remains unchanged, but should not get worse. Repeat testing demonstrating increased sensory or motor latencies suggests incomplete release. If the conduction velocities are improved, I am confident the transverse carpal ligament is completely released and additional surgery is not necessary.

Dr. Ring: *Since we cannot agree on the value and utility of routine electrodiagnostic testing for carpal tunnel syndrome, should patients be involved in the decision whether or not to get these tests?*

Dr. Hammert: I feel shared decision-making is an important part of practicing medicine in this era. My role as a physician is to give the patients information and involve them in the decision process for their treatment. As hand surgeons and orthopaedists, care is typically to improve quality of life and an educated patient should be involved in this process, given the constraints of our current healthcare system. This does not mean ordering or performing unindicted tests, such as MRI for routine carpal tunnel syndrome, but when there is sufficient evidence for more than one approach, and more than one potential reasonable

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treatment, it allows them to actively participate in their care. As healthcare changes, this may eventually involve patients assuming more financial responsibility for their decisions. In this scenario, if I am convinced that the patient has carpal tunnel syndrome, I would involve him or her in the decision-making process. I would ask the patient whether he or she would want to order preoperative electrodiagnostic studies. I would be comfortable proceeding with surgery without preoperative electrodiagnostic studies if that was the patient's choice.

Dr. Graham: At the risk of sounding paternalistic, I do not think patients should direct what investigations they have. Simply stated, we are the experts and we should utilize that expertise in making diagnoses and in explaining our approach. Patients may not understand the potential risks of inaccurate diagnostic testing. We need only look at the almost-universal findings of abnormality on MRI of the middle-aged wrist to understand that a test result, in and of itself, is not helpful without a context. It may be a lot harder to explain a positive test result that has no bearing on the patient's care than it might be to explain why the test it is not necessary to begin with. We only have to look at the controversy around prostate-specific antigen screening for prostatic cancer to see just how complicated testing of

unknown validity can be. It should be easy to explain to patients when tests are required to help with decision-making. When tests do not add value but do add delay, expense, and discomfort—not mention possible confusion—then it is our duty as the experts to advise patients not to have them.

Dr. Ring: *On occasion, patients with symptoms and signs strongly suggestive of carpal tunnel syndrome have electrophysiological evidence of cubital tunnel syndrome, cervical radiculopathy, or a generalized peripheral neuropathy. If we assume that carpal tunnel release can only do harm to these patients, what is an acceptable rate of misdiagnosis based on clinical criteria alone?*

Dr. Graham: If one accepts that patients may have compression of the median nerve in the carpal tunnel and normal electrodiagnostic measures of median nerve function, then carpal tunnel release when electrodiagnostic tests identify pathology of other nerves, and a normal median nerve, may do more good than harm. Having carpal tunnel syndrome does not disqualify an individual from having other nerve conditions either simultaneously or at a later date, and it takes skill to determine which problem is causing most of the symptoms. We can set appropriate expectations for the

result of a carpal tunnel release when other conditions (identified either clinically or on electrodiagnostic testing) may be responsible for some of the symptoms. The idea of misdiagnosis based on clinical criteria alone is somewhat curious to those of us who emphasize symptoms and signs over objective measure of pathophysiology. If surgical treatment is being considered, then obtaining additional information from electrodiagnostic testing may be useful. Weighing the relative importance of electrodiagnostic testing results and the clinical evaluation may vary from patient to patient and herein lies the art of the skillful clinician. Generally, the need for this information will be small if the clinical assessment is carefully made. A diagnostic aid like the CTS-6 could be helpful to the clinician with less experience making a diagnosis of carpal tunnel syndrome.

Dr. Hammert: While a patient may have carpal tunnel syndrome without electrodiagnostic evidence of median nerve compression at the wrist, this would represent a mild disease that we treat with splinting or corticosteroid injections. I do not know if we can agree on an acceptable rate of misdiagnosis. To some degree, this will be dependent on how we define harm. On the one hand, there are risks harm from adverse events such as infection and nerve injury after surgery and one can argue that placebo

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response or poor coping strategies are responsible for symptom relief following surgery without objective evidence of nerve compression. On the other hand, there is the harm of missing out on a helpful surgery.

Dr. Ring: *Many hand surgeons place priority on symptoms and signs and offer surgery even when electrodiagnostic testing is normal. Additionally, many surgeons ignore incidental (and seemingly asymptomatic) cubital tunnel syndrome and do not offer surgery until the patient has symptoms. From this point of view, electrodiagnostic testing is a waste of time and resources. Do you agree?*

Dr. Hammert: No. While I do not always offer surgery for asymptomatic

ulnar neuropathy at the elbow, I do counsel patients regarding the possibility of progression and permanent nerve injury, symptoms to look for, and reasons to return. Having heard this explanation, many, but not all patients will prefer to have the ulnar nerve released at the same time. Likewise, patients with electrodiagnostic abnormalities of both median nerves are often symptomatic on only one side. After discussion of the potential for progression and nerve damage—often insidiously and with few symptoms as occurred on the severely symptomatic side—many patients elect to have the less symptomatic or asymptomatic contralateral carpal tunnel released once they have

recovered from surgery on the more severe side.

Dr. Graham: I think electrodiagnostic testing is a waste of time and resources in this setting. I would not offer treatment for an asymptomatic cervical radiculopathy or ulnar nerve compression. In my opinion, these are not necessarily progressive and can improve without surgery. For me, the risks of surgery are more difficult to justify for an asymptomatic or minimally symptomatic electrophysiological abnormality than they are for a substantial symptoms in the absence of objectively measurable pathophysiology. I believe that patients can be trusted to notice symptoms from these conditions before irreversible changes occur.