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Treatment of Ulnar Nerve Compression at the Elbow

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Keywords

Evidence; ulnar nerve; compression; outcomes

The Patient

A 40-year-old assembly line worker at an automobile plant complains of numbness over the right ring and little fingers, and weakness of his right dominant hand. This numbness is causing him a great deal of discomfort at work, and he has difficulty sleeping because he is awakened most nights with numbness and pain in his hand. These symptoms have been present for the last 3 months. He has no prior elbow trauma.

Physical examination revealed a pronounced Tinel's sign of the ulnar nerve at the elbow that radiated to his ring and little fingers. The strength of the hand and two-point discrimination of the fingers were normal. His electrodiagnostic study showed a velocity across the elbow of 30 m/s (normal 50 m/s) and no muscle denervation.

The Question(s)

What is the most appropriate treatment for this patient?

Current Opinion

Conservative treatments are limited and consist of extension splinting of the elbow. Surgical treatments can be divided into two types: decompression without transposition (in-situ ulnar nerve decompression and medial epicondylectomy) and decompression with anterior transposition (subcutaneous, intramuscular, and submuscular).

The Evidence

Ulnar nerve compression at the elbow (UNE) is the second most common compressive neuropathy of the upper extremity. The prevalence of UNE is not known precisely, but is estimated at 1% in the United States.⁽¹⁾ Although it is reasonable to try the conservative option such as elbow extension splinting, keeping the elbow in the extended posture is functionally limiting and is not tolerated by most working patients. On the other hand,

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although surgical treatment is the preferred option for incapacitating discomfort, the most appropriate surgical treatment has not been sufficiently researched. The controversy about surgery for UNE has persisted for decades, and the choice of the procedure is often based on personal preferences rather than evidence.

To transpose or not to transpose

The advantage of simple decompression procedure is that there is less trauma to the nerve and all the blood supply to the nerve is maintained. The disadvantage is that while compression on the nerve is released, the tension on the nerve by being stretched behind the medial epicondyle is not relieved.

The advantages of decompression with transposition are that the nerve is moved to a new bed that may have less constrictive scarring and the nerve is effectively lengthened by a few centimeters by the anterior transposition. The disadvantage is that the epineural blood supply is partially interrupted, even though the ulnar nerve has a rich intraneural blood network. Furthermore, the manipulation of the nerve may create new sites of compression due to scar formation and potentially may encounter new constrictive bands proximally and distally by the nerve coursing through a new path.

What is the evidence?

Randomized controlled trials—Although no sufficiently powered randomized control trials have been performed to evaluate outcomes for these procedures, there are selected clinical trials that have compared simple decompression with an anterior transposition procedure. Nabhan et al. randomized 32 patient into simple decompression without transposition and 34 into subcutaneous anterior transposition.(2) The outcome measures were based on a non-validated pain scale, a subjective motor testing of intrinsic muscles, a sensory examinations using Semmes-Weinstein test and motor nerve conduction velocity. Patients attended follow-up assessments at 3 and 9 months after surgery. They found no difference in outcomes between these two groups. The main limitations of this trial are that the complication rates were not compared and the sample size is too small to be able to stratify by disease severity. The authors concluded that they favor the easier surgical procedure associated with simple decompression.

In another randomized controlled trial, Gervasio et al. randomized 70 patients with “severe cubital tunnel syndrome” into 2 groups of 35 subjects who underwent simple compression and anterior submuscular transposition.(3) Preoperatively, the study subjects had Dellon’s grade 3 (severe) syndrome. The subjects had follow-up evaluations at 6 months after surgery. For the simple decompression group, they found 54% excellent, 26% good and 20% fair results; and for the transposition group, they found 51% excellent, 31% good and 18% fair results. Because no significant difference is found, the authors also favor the simple decompression option.

Biggs et al. randomized patients into simple decompression (23 subjects) and submuscular anterior transposition (21 subjects).(4) Again, the outcomes of both groups are not

significantly different, except that 3 subjects in the transposition group had deep wound infections when compared to no infection in the simple decompression group.

Systematic reviews—Bartels et al. and Mowlavi et al. presented the most comprehensive systematic reviews to date to compare the various surgical options.^(5,6) Bartels et al. collected studies from the literature from 1970 to 1997. When the outcomes were analyzed without consideration of preoperative severity of ulnar nerve dysfunction, patients who underwent simple decompression had the most favorable outcome, whereas patients who underwent transposition had the worst outcome. However, when outcomes were controlled for severity of ulnar nerve dysfunction, no difference in outcomes was detected between these two treatment categories (Table 1).⁽⁵⁾ They also noted that complication rates relating to these surgical procedures were not consistently reported, but complications should be an important consideration in outcomes assessments. Based on this systematic review, the authors advocated the simple decompression procedure, except for situations when the ulnar nerve subluxes with elbow flexion for which an anterior transposition procedure is done. They noted that “the need for prospective randomized studies is obvious.”

A systematic review by Mowlavi et al. analyzed 30 published studies from 1945 to 1995.⁽⁶⁾ The authors divided the pre-operative status of the ulnar nerve into stages of disease severity. Overall, all the surgical procedures had good outcomes for “minimally and moderately severe” diseases. Among the minimally-severe group, medial epicondylectomy had the best outcome, and among the moderately-severe group, submuscular transposition had the best outcome. None of procedures were found to be effective for the severe group. As expected, patients treated non-operatively fared the worst.

Both systematic reviews acknowledged the low quality data presented in the literature. These shortcomings include unclear descriptions of the surgical techniques, variability of follow-up times, unscientific outcomes assessments and inconsistency in measuring preoperative ulnar nerve dysfunction.

Shortcomings of the Evidence

What does these data mean?

Thus far, the literature did not detect the “inferiority” of simple decompression when compared to the transposition procedures. In other words, simple decompression appeared to have similar outcomes when compared to the other more invasive transposition procedures. The three randomized controlled papers suffered from low power and reliance on outcomes instruments that were not validated. The two systematic reviews had to depend on rather poor quality data, and failed to demonstrate a “clinically” significant outcomes advantage of a particular technique. Despite these shortcomings, it is apparent that the difference in outcomes between simple decompression and transposition procedures are quite small. For example, to detect a difference in outcomes between 80% and 90% good results (10% difference) will require several hundred subjects, which can only be achieved through a multi-center clinical trial design. Before embarking on such a study, it is important to consider whether this difference is sufficiently large for surgeons to change their practices. The difference in outcomes may be small, but conceivably, patients undergoing the simple

decompression procedure may recover faster with less morbidity than the anterior transposition procedures, assuming the worse scenario of a 10% poorer outcome with the simple decompression procedure. These trade-offs can be incorporated into a decision analysis model to derive a most optimal treatment strategy, potentially obviating the need for enormous effort and costs associated with a multi-center clinical trial.

The Future

The future research for UNE may rely on having a multi-center clinical trial with sufficient sample size to have a high-powered study. For such a study, the study protocol must be designed carefully with input from research methodologists who have experience designing clinical trials. The outcomes endpoints must be defined carefully, and the most important consideration prior to engaging in this ambitious study is to establish the most appropriate patient-rated outcomes tool that can detect small differences in outcomes among the various surgical procedures. Instead of designing yet another outcomes tool for UNE, one should explore the currently available instruments that have been applied to carpal tunnel syndrome. The experience in studying carpal tunnel surgery outcomes can be translated into UNE outcome studies to gain a better understanding of the most appropriate treatment for this common peripheral nerve condition.

Current Concepts

In this analysis, there is no one surgical procedure that provides the most superior outcomes for UNE surgery. The differences in treatment effect may be quite small among these techniques. But it does appear that simple decompression deserves careful consideration because of its relative simplicity and faster recovery for the patient. If simple decompression is not successful, which can occur with any of the procedures currently performed, the anterior transposition procedures can still be performed without too much difficulty. Based on this review of literature and the rather compelling support for simple decompression procedure, I have changed my practice of performing subcutaneous anterior transposition in favor of simple decompression procedure by relying on the best available evidence in the literature.

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TABLE 1

Outcome in 2040 limbs treated for ulnar nerve compression*

Surgical Procedure	Outcome			
	Excellent	Good	Fair	Poor
Epicondylectomy	181 (44.6)	101 (24.9)	80 (19.7)	44 (10.8)
Decompression transposition	300 (50.8)	133 (22.5)	85 (14.4)	73 (12.3)
subcutaneous	124 (33.9)	81 (22.1)	107 (29.2)	54 (14.8)
intramuscular	118 (44.4)	83 (31.2)	37 (13.9)	28 (10.5)
submuscular	180 (43.8)	121 (29.4)	23 (5.6)	87 (21.2)
total	903 (44.3)	519 (25.4)	332 (16.3)	286 (14.0)

* Includes only those studies from which all different outcome grades could be extracted. Outcome is stratified by the number of limbs, and the percentages are given in parentheses.

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