

# Treatment of Ulnar Nerve Compression at the Elbow

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## THE PATIENT

A 40-year-old assembly line worker at an automobile plant complains of numbness over his 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 2-point discrimination of the fingers were normal. His electrodiagnostic study showed a velocity across the elbow of 30 m/s (normal  $\geq 50$  m/s) and no muscle denervation.

## THE QUESTION

What is the most appropriate treatment for this patient?

## CURRENT OPINION

Although it is reasonable to try nonsurgical treatment such as elbow extension splinting, most patients do not accept keeping the elbow in a relatively extended position. On the other hand, the most appropriate surgical treatment for ulnar nerve compression at the elbow (UNE) has been debated for decades, and the choice of the procedure is often based on personal preferences rather than evidence.

## THE EVIDENCE

Ulnar nerve compression at the elbow is the **second** most common peripheral mononeuropathy of the upper

extremity. The prevalence of UNE is not known precisely, but it is estimated **at 1% in** the United States.<sup>1</sup>

### Rationale: to transpose or not to transpose

The advantage of a **simple** decompression procedure is that there is less trauma to the nerve and better maintenance of the blood supply. The disadvantage is that compression is addressed but nerve tension is not. Furthermore, there is a small chance that the nerve may subluxate with elbow flexion.

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, although the importance of this is not known, given that 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.

### Randomized controlled trials

Although no sufficiently powered randomized, controlled trials have been performed to evaluate outcomes for these procedures, there are selected clinical trials, which were conducted by neurosurgeons from Europe and Australia who have **compared** simple decompression with an anterior transposition procedure. Nabhan et al. randomized 32 patients to simple decompression without transposition and 34 to subcutaneous anterior transposition.<sup>2</sup> The outcome measures were a nonvalidated pain scale, motor testing of intrinsic muscles, sensory examination using Semmes-Weinstein monofilaments, 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 2 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, Gerva-

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sio et al. randomized 70 patients with severe cubital tunnel syndrome into 2 groups of 35 subjects who had simple compression or anterior submuscular transposition.<sup>3</sup> Before surgery, 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; for the transposition group, they found 51% excellent, 31% good, and 18% fair results. Because no significant difference was 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).<sup>4</sup> Again, the outcomes of the 2 groups are not significantly different, except that 3 subjects in the transposition group had deep wound infections whereas there was 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.<sup>5,6</sup> 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 had simple decompression had the most favorable outcome; however, when outcomes were controlled for severity of ulnar nerve dysfunction, no difference in outcomes was detected between simple decompression and transposition.<sup>5</sup> They also noted that complication rates related to these surgical procedures were not consistently reported, but complications should be an important consideration in the outcomes assessments. Based on this systematic review, the authors advocated the simple decompression procedure, except for situations in which 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.<sup>6</sup> The authors divided the preoperative 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; among the moderately severe group, submuscular transposition had the best outcome. None of the procedures

were found to be effective for the severe group. As expected, patients treated nonsurgically 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

Thus far, the literature **has not identified an inferiority** of simple decompression when compared to the transposition procedures. In other words, simple decompression appears to have similar outcomes when compared to the other more invasive transposition procedures. The 3 randomized, controlled trials suffered from low power and reliance on outcomes instruments that were not validated. The 2 systematic reviews had to depend on relatively poor quality data and failed to demonstrate clinically important 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. The issue of clinically important or meaningful difference for UNE surgery has yet to be established. In carpal tunnel syndrome, the minimum clinically important difference after surgery has been shown to be large (effect size over 0.8). The effect size after surgery for UNE may be much smaller and may be in the moderate range of 0.5. A large sample size, which may require a multicenter clinical trial design, might be necessary to detect such a small difference. Before embarking on such a study, it is important to consider whether this difference is sufficiently large for patients and surgeons to change their preferences. When the difference in outcomes is small, patients having the simple decompression procedure might value a more limited surgery and faster recovery even when facing the worst-case scenario (eg, 10% complications such as subluxation). These trade-offs can be incorporated into a decision analysis model to derive an optimal treatment strategy, potentially obviating the need for enormous effort and costs associated with a multicenter clinical trial.

### THE FUTURE

The future research for UNE may rely on having a multicenter 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 in designing clinical trials. The conduct of the surgical procedures must be stan-

standardized among the participating centers and explicitly outlined in the manual of operating procedures. Severity of UNE should be categorized based on the accepted, available classification systems and electrodiagnostic studies. The outcomes endpoints must be defined carefully, and the most important consideration before engaging in this ambitious study is to establish the most appropriate patient-rated outcomes tool that can detect moderate or small differences in outcomes among the various surgical procedures. Instead of designing yet another outcomes tool for UNE, we should explore the currently available instruments that have been applied to carpal tunnel syndrome. These tools should include the evaluation of the Levine-Katz carpal tunnel questionnaire, the Disabilities of the Arm, Shoulder and Hand questionnaire, and the Michigan Hand Outcomes Questionnaire, which have been shown to be reliable, valid, and responsive for measuring outcomes after carpal tunnel surgery. It has been shown that these patient-rated questionnaires are much more responsive than physical measures, sensory examinations, and electrodiagnostic studies. 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 single** best surgical procedure 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 potential for quicker recovery. **Furthermore, if simple decompression is not successful, an anterior transposition procedure can still be performed without too much difficulty.** Based on my review of the best available evidence, I have changed my practice of using a subcutaneous anterior transposition in favor of a simple decompression procedure.

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