

# Risk Factors for Ulnar Nerve Instability Resulting in Transposition in Patients With Cubital Tunnel Syndrome

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**Purpose** To assess the incidence of ulnar nerve instability in patients undergoing *in situ* decompression and to identify preoperative risk factors to predict the need for transposition.

**Methods** Using our surgical database, we retrospectively identified 363 patients who were candidates for *in situ* ulnar nerve decompression for the treatment of cubital tunnel syndrome over a 5-year period. During this time, the 3 participating surgeons considered ulnar nerve instability to be a contraindication for *in situ* ulnar nerve decompression. We collected demographic data including sex, age, weight, height, and body mass index. We recorded the number of patients who underwent ulnar nerve transposition owing to ulnar nerve instability and evaluated whether ulnar nerve instability was diagnosed before, during, or after surgery.

**Results** Of the 363 patients who were considered for *in situ* ulnar nerve decompression, 76 patients (21%) underwent ulnar nerve transposition secondary to ulnar nerve instability. Twenty-nine patients (8%) were identified with instability before surgery, and 44 patients (12%) were identified with instability during surgery following *in situ* decompression. Three patients (1%) were not diagnosed with instability until after surgery and subsequently underwent secondary transposition. Patients who underwent transposition owing to instability were more likely to be male and to be younger.

**Conclusions** A notable percentage of patients with a stable nerve before surgery will have ulnar nerve instability following decompression. Identification of factors correlating to instability and the potential need for transposition can aid surgeons and patients in preoperative planning. (*J Hand Surg Am.* 2016;41(2):180–183. Copyright © 2016 by the American Society for Surgery of the Hand. All rights reserved.)

**Type of study/level of evidence** Prognostic II.

**Key words** Cubital tunnel syndrome, ulnar nerve decompression, ulnar nerve instability, ulnar nerve transposition.

**N**O CLEAR CONSENSUS EXISTS REGARDING the optimal treatment of cubital tunnel syndrome.<sup>1</sup> Given the lack of evidence demonstrating superiority of any one specific technique, many surgeons

favor *in situ* ulnar nerve decompression owing to its ease. However, anterior ulnar nerve transposition remains an appropriate treatment option in patients with prior ulnar nerve surgery who require revision and patients with concomitant elbow arthritis or deformity. These factors are readily identifiable before surgery. Patients with ulnar nerves that dislocate out of the epicondylar groove as the elbow is flexed are also generally treated with transposition, but the presence and degree of instability can be difficult to assess before surgery. In addition, the ulnar nerve may become unstable upon decompression of the cubital tunnel in patients that did not display instability before surgery.

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Recognition during surgery of instability is important because surgical failure and persistent neuropathy are possible sequelae of an unstable ulnar nerve.<sup>2</sup>

For both the patient and the physician, the difference between a decompression *in situ* and a decompression with transposition is not inconsequential. Preoperative counseling varies between the two procedures as the risks (particularly of devascularization, worsening of nerve function, or wound issues with transposition)<sup>3–5</sup> and postoperative course (potential need for immobilization or orthosis fabrication after transposition) differ. Furthermore, decompression requires less surgical time than transposition,<sup>3</sup> which can lead to imprecision of surgical scheduling.

The purpose of this study was to determine the incidence of ulnar nerve instability resulting in transposition in patients considered for *in situ* decompression. We also sought to identify risk factors to help determine before surgery which patients may benefit from transposition owing to an unstable nerve.

## METHODS

Institutional review board approval was obtained for this study. Using our surgical database, we retrospectively identified all patients undergoing surgical treatment for cubital tunnel syndrome by 3 surgeons (J.L.M., K.F.L., P.K.B.) over a 5-year period (2009–2013). Prior to surgery, patients had undergone a trial of nonsurgical treatment based on the discretion of the attending surgeon and the preference of the patient. In general, a trial of elbow orthosis fabrication was recommended for all patients unless there were already objective motor/sensory changes or denervation on nerve studies. During the study period, all 3 surgeons preferred *in situ* ulnar nerve decompression over anterior transposition for the surgical treatment of isolated cubital tunnel syndrome; however, ulnar nerve instability was considered a contraindication for *in situ* ulnar nerve decompression. We included all patients who were candidates for *in situ* ulnar nerve decompression. Patients identified before surgery as requiring ulnar transposition for any reason other than ulnar nerve instability (such as revision ulnar nerve surgery, severe elbow arthritis, elbow contracture, and associated fracture or deformity) were excluded.

Three hundred sixty-three patients met the inclusion criteria. We collected demographic data including age, sex, weight, height, and body mass index (BMI). We recorded the number of patients who underwent ulnar nerve transposition owing to ulnar nerve instability and evaluated whether ulnar nerve instability was diagnosed before surgery, during surgery following

decompression, or after surgery. The individual surgeons diagnosed ulnar nerve instability, which we defined as anterior dislocation of the nerve out of the ulnar groove and over the medial epicondyle with elbow flexion. For patients in whom this occurred, an anterior transposition was performed. The type of transposition (subcutaneous, intramuscular, or submuscular) varied based on surgeon preference.

## Data analysis

To predict the need for transposition owing to ulnar nerve instability, we created a logistic regression model using demographic data as independent variables. Because height, weight, and BMI are associated, they were each evaluated in separate multivariate models. Statistical significance was set at  $P \leq .05$ .

## RESULTS

Of the 363 patients who were considered appropriate for *in situ* ulnar nerve decompression, 76 patients (21%) underwent ulnar nerve transposition secondary to nerve instability. Twenty-nine patients (8%) were identified with instability before surgery, and 44 patients (12%) were identified with instability during surgery following *in situ* decompression. Three patients (1%) were not diagnosed with instability until after surgery and subsequently underwent transposition. No patients were diagnosed with instability before surgery and then found to be stable during surgery.

In regards to surgeon variability, Surgeon A identified instability in 18 patients before surgery and 10 patients during surgery. Surgeon B identified instability in 10 patients before surgery and 21 patients during surgery. Surgeon C identified instability in 1 patient before surgery and 13 patients during surgery. Only surgeon B identified postoperative instability in 3 cases.

Demographic results are shown in Table 1. The strongest predictor of instability resulting in transposition was male sex with an odds ratio of 2.92 (95% confidence interval, 1.22–6.97;  $P = .016$ ). Younger patients with an odds ratio of 0.96/year (95% confidence interval, 0.94–0.98;  $P < .001$ ) were also significantly more likely to undergo transposition (Fig. 1). Lighter patients ( $P = .078$ ) and patients with lower BMI ( $P = .057$ ) did not have an increased risk for ulnar nerve instability.

## DISCUSSION

Cubital tunnel syndrome is the second most common compression neuropathy of the upper extremity, but the optimal treatment has not been determined. Historically, anterior transposition of the ulnar nerve has been favored owing to concerns regarding a traction

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