



## Research Article

# Does the Dominant Hand Factor Have an Effect on Postoperative Improvement in the Surgical Treatment of Ulnar Nerve Entrapment?

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## Abstract

**Objectives:** Ulnar nerve entrapment is the most frequently encountered entrapment neuropathy after the carpal tunnel syndrome. Surgical treatment is usually suggested to patients who do not benefit from conservative treatment. In this study, we aimed to examine the effect of the dominant hand on the clinical results of ulnar nerve decompression surgery.

**Methods:** 48 (25 D, 23 N-D) patients were included in the study. The Edinburgh Handedness Inventory was used to identify the dominant hand of patients included in the study. Visual analogue scale (VAS) values were evaluated pre- and postoperatively.

**Results:** 25 patients underwent surgery on the dominant hand and 23 patients had surgery to their non-dominant hand. The VAS values of patients who underwent non-dominant hand surgery were lower than those who underwent surgery on the dominant hand.

**Conclusion:** In our study, the recovery time of patients operated on the dominant side due to ulnar nerve compression was longer than the patients operated on the non-dominant side. In our opinion, exercise and protection programs for dominant hands in the postoperative period of ulnar nerve entrapment surgery, in addition to a good surgical technique, positively affects the results of surgical treatment.

**Keywords:** Dominant hand, ulnar nerve, nerve entrapment, surgical treatment

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Ulnar nerve entrapment (UNE) in the cubital fossa is the second most common peripheral nerve entrapment neuropathy (ENP) after carpal tunnel syndrome.<sup>[1]</sup> Its average annual incidence is 24.7 per 100.000 people.<sup>[2]</sup>

Although the ulnar nerve is entrapped at various anatomical sites and secondary to various etiologies along its course, the most common anatomical site of entrapment is the elbow region. Ulnar neuropathy occurring at the level

of the elbow is 3-8 times more common in men.<sup>[3-5]</sup>

Patients usually present with numbness in the 5<sup>th</sup> finger and half of the 4<sup>th</sup> finger, as well as paresthesia. They also show reduced handshake strength, weakened intrinsic muscles of the hand, and loss of manual skills. Such symptoms are exacerbated by elbow flexion. A 6-week course of conservative therapy should be preferentially considered for ulnar nerve ENP, and surgery should be contemplated

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when the initial conservative therapy fails.<sup>[6]</sup>

Ulnar nerve entrapment at the level of the elbow may occur secondary to a multitude of causes, including systemic disorders, prolonged tourniquet application, medial epicondyle fracture, cubitus valgus deformity, professions requiring repetitive elbow flexion-extension or leaning the elbow to a fixed place for long periods, and sleeping with the elbow in the flexion position.<sup>[6]</sup>

A variety of prognostic factors, including age, symptom duration, body mass index, smoking, diabetes mellitus, cervical spondylosis, and electrophysiological results, have been proposed for ulnar nerve entrapment neuropathy.<sup>[7]</sup>

In the present study, we aimed to analyze the effects of the dominant hand on surgical outcomes, which have not been studied before.

## Methods

This study was approved by the Eskişehir Osmangazi University Clinical Studies Ethics Committee and in accordance with the current version of the Helsinki Declaration. This study enrolled patients who had been operated for ulnar nerve entrapment at the level of the elbow at our clinic between 2007 and 2017. The medical records of the patients were retrospectively reviewed. Informed consent had been obtained from all patients before the surgery. The patients with ulnar ENP secondary to trauma and the patients with electrodiagnostic polyneuropathy and radiculopathy were excluded from this study. Age, sex, dominant hand, pre-operative EMG results, neurological examination findings, and visual analog scale (VAS) scores were analyzed. The dominant hand of each patient was determined using the Edinburgh hand preference test.<sup>[8]</sup>

## Statistical Analysis

To investigate the effects of the dominant hand on surgical outcomes in ulnar entrapment neuropathy, this study used descriptive statistics, including mean, median, standard deviation, minimum, and maximum for continuous (numerical) variables and number (n) and percentage (%) for categorical variables. The sample size of this study was determined by aiming at a study power of at least 0.80 and a type 1 error of 0.05. The normality of continuous variables was tested using the Kolmogorov Smirnov ( $n > 50$ ) test. As the variables were not normally distributed, the nonparametric tests were used. The measurements were compared by the dominant hand and BMI using the Mann Whitney-U test. The comparisons between categorical variables were performed with the Pearson Chi-square test. The statistical significance level (alpha level) was considered 5% for all statistical analyses. All analyses were

performed with SPSS (IBM SPSS for Windows, ver.24) statistical software package.

## Surgery

After informed consent for surgery was obtained from the patient to be operated, an intravenous antibiotic was administered, and the patient was taken to the operating room. The patient was then intubated by a member of the Anesthesiology Department. To avoid corneal abrasions, both eyes were applied ointment and taped. The arm undergoing surgery was cleaned and draped properly, and a local anesthetic was infiltrated to the curvilinear skin incision running posteriorly to the medial epicondyle. Skin incision with a No 15 scalpel was followed by the dissection of the subcutaneous fat tissue. Hemostasis was achieved by bipolar electrocautery, and sharp dissections were performed using Metzenbaum scissors. Ulnar nerve was exposed proximal to the medial epicondyle. An incision was made to extend to the medial intermuscular septum proximally, and the cubital ligament distally. Then, fibro-aponeurotic bands were dissected by taking care, not to sever any branch of the ulnar nerve. The ulnar nerve was freed at the level of the elbow and then transposed. A Jackson Pratt drain was placed. The fascia was sutured with continuous sutures using 0 PDS. After suturing the subcutaneous tissue with 2/0 prolene and the skin with 3/0 prolene, the procedure was finished.

## Results

**Group 1:** The number of patients operated from the dominant side was 25 (3 left-handed, 22 right-handed). Twelve patients were male, and 13 were female; the patients had a mean age of 48.6 (18-69) years. The mean follow-up duration was 54.2 months (24-143). One of the patients in Group 1 was reoperated four years after the first operation. He was a male with right-hand dominance and a BMI of 27.6. Three patients did not show a marked resolution of their symptoms (VAS pre-op/post-op 8/8, 7/7, 10/5); all three were female and had a BMI over 25.

**Group 2:** The number of patients operated from the non-dominant side was 23 (21 right-handed, two left-handed). Fourteen of them were male, nine were female, and the mean duration of follow-up was 45.8 months (24-142). The mean age of the patients was 49.2 (33-64) years.

Patients in Group 2 did not undergo re-operation. Two patients did not show a marked resolution of symptoms (VAS pre-op/post-op 9/9, 9/8); one of them was a male operated from the left side, who was 39 years old and had a BMI 29; the other one was a female operated from the right side, who was 38 years old and had a BMI 23.

The demographic data of the patient groups are presented in Table 1.

## Discussion

The most suitable surgical treatment option for ulnar nerve entrapment neuropathy is still debated. Decompression + transposition is the most commonly performed surgical treatment option at our clinic.<sup>[9]</sup>

Although from an epidemiological standpoint, several studies have reported that ENP is more common in men, our study did not find any significant sex-based difference.<sup>[3]</sup>

While traumatic ulnar neuropathies are more common in the dominant hand, ulnar entrapment neuropathies are typically found on the non-dominant side.<sup>[6, 10]</sup>

In a study reported by Yıldırım et al., ulnar neuropathy was found in the left upper extremity in 75% of the patients. Studies reported by Todnem et al. and Visser et al. found the proportions of 79% and 65%, respectively, of the left upper extremity with DUN.<sup>[2, 11, 12]</sup> The situation is just the opposite of carpal tunnel syndrome in that it is more common on the dominant side.<sup>[10, 13, 14]</sup> Considering that the majority of people have right side dominance, this situation looks illogical at first glance. However, when the dominant hand is actively used, the elbow region of the non-dominant side is leaned to a fixed surface and kept flexed, creating a predisposition for neuropathy development.

Furthermore, these are the studies where ulnar neuropathy was detected. A review of the surgical series in the literature reveals no significant difference between the left and right sides.<sup>[3, 4, 11, 12]</sup>

Our study showed that, among patients who had undergone prior surgery, patients operated from the right side, and patients operated from the left side had equal numbers. There was no significant difference between the number of patients operated from the dominant side (Group 1: 25) and that of the patients operated from the non-dominant side (Group 2: 23). That is, the dominant hand shows a greater tendency to develop ulnar neuropathy; however, one may argue that surgical candidacy and progression are more likely in the actively used (i.e., dominant) hand. In this way, numerical equality/approximation occurs in surgical cases, which is supported by literature data and our findings.

Çivi et al.<sup>[14]</sup> reported a somewhat higher postoperative VAS score for the dominant hand among surgically managed patients with carpal tunnel syndrome. In agreement with that report, our study showed a lower postoperative VAS score in patients operated from the non-dominant hand, although that difference did not reach statistical significance (Table 2). This may be explained by more active use

**Table 1.** Demographic properties of the patients in Group 1 and Group 2

	Group 1	Group 2
Average Age	48.6 (18-69)	49.2 (33-64)
Average Follow-up Time	54.2 Month (24-143)	45.8 Month (24-142)
Sex, n (%)		
Female	13 (52)	9 (39.1)
Male	12 (48)	14 (60.9)
Operation Side, n (%)		
Right	22 (88)	2 (8.7)
Left	3 (12)	21 (91.3)

**Table 2.** Comparison of the average of the VAS scores in Group 1 and Group 2

	Preoperative VAS	Postoperative VAS
Group 1	9.32	1.8
Group 2	9.43	1.65

of the dominant hand in the postoperative period, thus prolonging the recovery time.

The limitations of our study are its retrospective design and a relatively small sample size. On the other hand, its strengths include all surgical procedures and postoperative checks were performed by a single surgeon and a long follow-up period.

## Conclusion

In conclusion, it should be remembered that, among patients undergoing surgery for ulnar neuropathy, the recovery time of the dominant hand may be somewhat longer than that of the non-dominant hand. Additional rehabilitation programs may be designed to prevent this inequality.

## Disclosures

**Ethics Committee Approval:** This study was approved by the Eskişehir Osmangazi University Clinical Studies Ethics Committee with the decision number of 31 and date of 16.06.2020.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** None declared.

**Authorship Contributions:** Concept – E.B.B.; Design – S.A.; Supervision – E.B.B.; Materials – S.A.; Data collection &/or processing – S.A. Analysis and/or interpretation – E.B.B.; Literature search – E.B.B.; Writing – E.B.B., S.A.; Critical review – E.B.B., S.A.

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