

# The effect of unilateral carpal tunnel release on the non-operated contralateral hand

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## Abstract

**Background.** Carpal tunnel syndrome (CTS) is often (60–90%) a bilateral condition. It has been suggested that patients with bilateral disease may benefit in the non-operated hand after unilateral surgery.

**Objectives.** To investigate the effect of unilateral carpal tunnel release on the non-operated contralateral hand.

**Material and methods.** In 186 patients with bilateral CTS, a number of measurements were performed prior to surgery. The patients were scheduled for surgery on the other hand operation 3 months after the first. Upon admission, the same measurements were performed on the still unoperated hand.

**Results.** All subjective variables were significantly better in the hand scheduled for operation as compared to the second one. Pain intensity was lower by a mean of 0.8 on a numeric rating scale (NRS); Levine symptom and function scores were lower by a mean of 0.7 and 0.3, respectively. Digital sensibility and grip strength were also better, but the changes were without clinical or statistical significance. Asked directly about the status of the non-operated hand, 109 patients (64%) reported improvement, 40 (23%) noted no change and 21 (13%) deterioration.

**Conclusions.** Regardless of the reasons for improvement, this study demonstrates that 64% of patients feel partial relief in the non-operated hand after unilateral carpal tunnel release.

**Key words:** outcome measures, carpal tunnel syndrome etiology, bilateral manifestation, carpal tunnel surgery

## Cite as

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## Introduction

Carpal tunnel syndrome (CTS) is the most common peripheral nerve neuropathy, affecting about 5–6% of women over 40 years of age.<sup>1–7</sup> Carpal tunnel syndrome is often (60–90%) a bilateral condition.<sup>8–13</sup> It has been suggested that patients with bilateral CTS may benefit in the non-operated hand after unilateral surgery.<sup>14–16</sup> It is, however, difficult to determine if the effect experienced by some patients in the non-operated hand is caused by the operation on the contralateral hand, or if it may rather be attributed to spontaneous recovery in some patients.<sup>17,18</sup> The postoperative clinical course of the non-operated contralateral hand in unilateral CTS is not well-documented. The prevalence of CTS in the general population makes the choices and timing for treatment a relevant issue. The objective of this study was to investigate the effect of unilateral carpal tunnel release on the non-operated contralateral hand.

## Material and methods

From 2016 to 2017, we recruited 186 patients, 155 women (83%) and 31 men (17%) with a mean age of 57 years, presenting to our department with bilateral CTS for carpal tunnel surgery. The study was approved by the medical



Fig. 1. Incision for mini-invasive carpal tunnel release



Fig. 2. View of the operation site after dissection of the flexor retinaculum. Note scissors inside the carpal tunnel

research and ethics committee of the Pomeranian Medical University in Szczecin, Poland. The diagnosis of CTS was made on the basis of clinical findings and the results of electrodiagnostic tests, which were positive in both hands of all the patients. Patients presenting with comorbidities such as diabetes, rheumatoid arthritis or a history of hypothyroidism were not excluded. The preoperative measurements included subjective pain intensity on a numeric rating scale (NRS), digital sensibility using Semmes–Weinstein filaments, grip strength with a Jamar dynamometer, and the Levine questionnaire. The objective measurements (digital sensibility and grip strength) were performed in both hands at the time of the 1<sup>st</sup> operation and 3 months later, before the 2<sup>nd</sup> operation. The patients underwent mini-invasive carpal tunnel release in one hand, under local anesthesia, with the use of a tourniquet (Fig. 1,2). Upon discharge, each patient's next hand operation was scheduled for a date 2–4 months after the first one (mean: 3 months). Of the 186 patients who underwent operation on one hand, 170 (91%) were admitted to the hospital for surgery to the other hand. The same measurements were performed as prior to the first operation. The results of these measurements were compared. The statistical significance of differences in outcomes was examined using the Mann–Whitney U test for non-normal distribution of variables.

## Results

All the subjective variables were significantly better in the hand which was scheduled for operation than the second one (Table 1). Pain intensity was lower by a mean of 0.8 on the NRS; the Levine symptom and function scores were lower by means of 0.7 and 0.3, respectively. The patients were also asked if they could feel any improvement in the second hand scheduled for operation. One hundred and nine patients (64%) reported improvement, 40 (23%) noted no change and 21 (13%) deterioration. Of the 16 patients who did not present for the 2<sup>nd</sup> operation, 11 were located and responded to the survey by telephone. Among them, 7 patients reported improvement in the non-operated hand and declined further surgery; 4 others postponed surgery for non-medical reasons.

A minimal clinically important difference (MCID) is the smallest change in an outcome measure that is clinically meaningful (relevant to the patient), and not simply statistically significant. Based on our systematic analysis of the literature, an improvement of (roughly) 1.0 point on both the symptom severity score (SSS) and functional system score (FSS) is considered a minimal clinically important difference.<sup>19</sup> Based on the mean values of the SSS scores in our study, the reductions of symptoms in the non-operated hand, although statistically significant, did not reach clinical relevance. However, 109 patients (64%) experienced and declared improvement in the non-operated hand at the time of admission for 2<sup>nd</sup> operation. Answering direct question, these 64% of the patients confirmed that the reduction in their symptoms was clinically relevant for them. However, none of them opted for splint or steroid injection, mostly because they considered this improvement transient.

## Discussion

The results of this study show spontaneous clinical improvement in the non-operated hand in 64% of patients suffering from bilateral CTS, after contralateral carpal tunnel release. This effect was detected at the time of the patients' admission to the hospital for surgery on the other hand,

at a mean of 3 months after the 1<sup>st</sup> operation. It was not clearly determined when after the operation the symptoms started to withdraw, but in 1 study this beneficial effect was observed as early as 2 days postoperatively.<sup>1</sup>

Literature about this phenomenon is very scarce. Yoon et al. reported that in 15 of 20 patients with bilateral CTS, symptoms in the non-operated hand subsided within 1 year following surgery; this, however, did not translate into improvement in electrodiagnostic studies.<sup>14</sup> Unno et al. reported significant reduction of pain, nocturnal symptoms and paresthesia on the non-operated side 6 months after the operation in 58 of 69 patients (84%). At 12 months, 51 (74%) of these patients reported minimal or no remaining symptoms in the non-operated hand. Only 13 of them (19%) had carpal tunnel surgery on the other hand during the observation period. Electrophysiological tests on the non-operated hand were not repeated.<sup>15</sup> Conversely, the authors of another study found no improvement in the non-operated hand 6 months after unilateral surgery.<sup>16</sup>

Several hypotheses have been proposed to explain this phenomenon.<sup>20–28</sup> The results of studies on animal models have suggested that chronic neuropathic pain might use different transmission patterns than acute, somatic pain. Nociceptive stimulation may be conducted diffusely, involving the somatosensory cortex bilaterally, and this may translate as perception of pain in the contralateral extremity.<sup>29</sup> The same mechanism may be responsible for an experience of pain cessation in both extremities after intervention performed on only one. “Immune activation” of peripheral nerves may also be involved in the development of pathological “mirror allodynia” in the contralateral extremity after experimental inflammatory neuritis was induced in an ipsilateral one. These animal models suggest that complex neuro-humoral and immune responses might regulate induction (and cessation) of nociceptive signals in a way that is still poorly understood.<sup>16,29</sup>

## Conclusions

Regardless of the reasons for improvement, this study demonstrates that 64% of patients feel partial relief in the non-operated hand. A weak point in this study

**Table 1.** Comparison of variables prior to operations on the first compared to the second hand

Parameter	First hand n = 186		Second hand n = 170		p-value
	mean	SD	mean	SD	
Pain intensity (NRS, range: 0–10)	6.4	3.0	5.6	3.0	0.01
Sensory Index (range: 1–5)	3.4	0.8	3.6	1.0	0.03
Total grip strength [kg]	17.7	10.4	18.5	10.0	0.34
Levine symptom score	3.2	0.6	2.5	0.8	0.001
Levine function score	3.2	0.7	2.9	0.8	0.007

SD – standard deviation; NRS – numeric rating scale.

is that the results of our measurements might be partially attributed to the patients' preference for having surgery on the more symptomatic hand first. Another possible explanation may include a reduction in activity and repetitive work done by the non-operated hand as an effect of functional improvement in the operated hand. In this study design, we cannot exclude influence of these factors.

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