

# Self-Reported Outcomes for Patients Undergoing Revision Carpal Tunnel Surgery With or Without Hypothenar Fat Pad Transposition

HAND  
2018, Vol. 13(3) 292–295  
© The Author(s) 2017  
Reprints and permissions:  
sagepub.com/journalsPermissions.nav  
DOI: 10.1177/1558944717701243  
hand.sagepub.com

Gregory I. Pace<sup>1</sup>, Connor L. Zale<sup>1</sup>, David Gendelberg<sup>1</sup>,  
and Kenneth F. Taylor<sup>1</sup>

## Abstract

**Background:** Carpal tunnel surgery is the most common surgical procedure performed on the hand. Although complications are rare, recurrent or persistent carpal tunnel syndrome can be a significant problem after primary decompression. Various procedures have been described for the treatment of these patients including repeat decompression and hypothenar fat pad transposition. The purpose of this study is to compare the outcomes of patients undergoing revision carpal tunnel decompression with and without hypothenar fat pad transposition. **Methods:** We performed a retrospective review of all patients undergoing revision carpal tunnel surgery at our institution between 2002 and 2014. Identified patients were contacted by telephone. A Boston Carpal Tunnel Questionnaire (BCTQ) was administered to all participants. **Results:** Seventy-six patients underwent revision carpal tunnel surgery over the study period. Twenty-nine of 45 potential participants provided a survey response (64.9%) representing a total of 33 carpal tunnel revision surgeries. Seventeen hands underwent repeat decompression alone, and 16 hands underwent repeat decompression with hypothenar fat pad transposition. A trend toward improved overall BCTQ score was noted for patients undergoing decompression alone; however, no significant difference was determined for total survey score by procedure type. Similarly, total symptom severity and functional scores were not statistically significant between groups; however, a trend toward significance for improved symptom severity score was observed in patients undergoing decompression alone. **Conclusions:** Our results reveal no difference in self-reported symptom severity and functional scores between patients undergoing revision carpal tunnel surgery with repeat decompression alone or decompression with fat pad transposition.

**Keywords:** carpal tunnel, revision carpal tunnel, hypothenar fat pad transposition

## Introduction

Carpal tunnel release (CTR) for the treatment of carpal tunnel syndrome is one of the most common surgical procedures performed on the hand.<sup>4</sup> Primary decompression can be performed through an open or endoscopic approach, both with excellent success rates.<sup>19</sup> Although complications are rare, recurrent or persistent carpal tunnel syndrome can be a significant problem. Development of recurrent symptoms is thought to be due to postoperative adhesions, tenosynovitis, and intraneural fascicular scarring.<sup>8,10,15,16</sup> Alternatively, persistent symptoms in patients who experience no relief or incomplete relief following primary decompression are thought to be due to an incompletely released transverse carpal ligament (TCL).<sup>8,10,15,16</sup> This can also be due to severe preoperative compression, double crush, or other associated disease states affecting the nerve, such as diabetes.<sup>15</sup> In many

cases, however, the cause for recurrent or persistent symptoms is not readily identified.<sup>8,15,16</sup>

Multiple surgical procedures have been reported for the treatment of revision carpal tunnel surgery. Repeat simple open decompression is considered the current standard; however, several other techniques including various flap techniques have been proposed.<sup>2,3,8,16,18</sup> Hypothenar fat pad transposition is one of the more commonly performed procedures for CTR surgery.<sup>2,5,9,12,16</sup> With this technique, an ulnarly based pedicled flap of hypothenar fat is mobilized

<sup>1</sup>Penn State Hershey Medical Center, Department of Orthopaedics and Rehabilitation, Hershey, PA, USA

### Corresponding Author:

Kenneth F. Taylor, Penn State Hershey Bone and Joint Institute, 30 Hope Drive, EC09, Hershey, PA 17033, USA.  
Email: ktaylor3@pennstatehealth.psu.edu

and interposed between the median nerve and the deep surface of the radial portion of the TCL.

The purpose of this study is to compare the long-term outcomes of patients undergoing revision carpal tunnel surgery with simple repeated open decompression versus the addition of hypothenar fat pad transposition. We hypothesize that there is no significant difference in patient-reported outcomes between simple repeat decompression and decompression with hypothenar fat pad transposition.

## Methods

This study was approved by the College of Medicine institutional review board. The hospital electronic medical record was used to identify patients who underwent a carpal tunnel revision surgery between 2002 and 2014. Patients with a complete office note in the electronic medical record system were eligible for the study. Patient age, sex, date of primary and revision surgery, presenting symptoms prior to revision surgery, electromyography (EMG) results, and presence of comorbidities were recorded. All identified patients were contacted by telephone and verbal consent was obtained. These patients were verbally queried regarding recurrence of carpal tunnel symptoms and dates of any further treatment of the affected hand. Patients were excluded after telephone call attempts if they declined participation, had died, experienced cognitive impairment that would prohibit study consent, or received additional treatment for their carpal tunnel symptoms. A Boston Carpal Tunnel Questionnaire (BCTQ) was administered to all participants.<sup>11</sup>

Seventy-six patients underwent 88 revision carpal tunnel surgeries over the study period. Eight patients were excluded due to incomplete medical records, and 21 patients were lost to follow-up or deceased. Two patients were excluded due to revision for a median nerve neuroma and a severed digital nerve. Of the remaining 45 potential study participants, 1 patient refused participation and 15 patients were unable to be contacted. Twenty-nine patients provided a survey response (64.9%) representing a total of 33 carpal tunnel revision surgeries; 17 hands underwent repeat decompression alone, and 16 hands underwent repeat decompression with hypothenar fat pad transposition. All participants had clinical exam findings consistent with carpal tunnel syndrome prior to surgery. All participants except for one had an abnormal EMG with an abnormal motor exam, abnormal sensory exam, or both prior to the revision carpal tunnel procedure. Average time between primary and revision procedure was 6.2 years (range, 1 month to 29 years), and average patient follow-up from the time of revision surgery was 4.4 years (range, 1.3-12.9 years).

The mean values of continuous variables were compared using the independent *t* test, and the comparisons of categorical variables were assessed using the Fisher exact test. Statistical significance was defined as  $P < .05$ .

## Results

No significant difference in comorbidities was determined for patients with diabetes, hypertension, hypothyroidism, or smoking status by procedure type (Table 1). No correlation was determined between demographic information and overall score (Table 1). There was no significant difference in total survey score by procedure type ( $P = .09$ ). A trend toward improved symptom severity score was noted for patients undergoing decompression alone; however, this did not achieve significance ( $P = .07$ ). Overall functional scores were not statistically significant between groups ( $P = 0.35$ ; Table 2).

Twenty-three patients had recurrent symptoms, and 8 patients described persistent symptoms since their primary decompression. The type of symptoms could not be determined for 2 patients undergoing revision decompression. Presence of symptoms as persistent or recurrent did not have a statistically significant effect on overall survey score when comparing patients within the same procedure group (decompression persistent vs decompression recurrent,  $P = .31$ ; transposition persistent vs transposition recurrent,  $P = .3$ ) or between procedure groups (decompression persistent vs transposition persistent,  $P = .18$ ; decompression recurrent vs transposition recurrent,  $P = .71$ ). Status of symptoms as persistent or recurrent also did not have a statistically significant effect on functional status within procedure groups (decompression persistent vs decompression recurrent,  $P = .42$ ; transposition persistent vs transposition recurrent,  $P = .25$ ) or between procedure groups (decompression persistent vs transposition persistent,  $P = .23$ ; decompression recurrent vs transposition recurrent,  $P = .9$ ). Similarly, symptoms as persistent or recurrent also did not have a statistically significant effect on symptom severity score within procedure groups (decompression persistent vs decompression recurrent,  $P = .44$ ; transposition persistent vs transposition recurrent,  $P = .25$ ) or between procedure groups (decompression persistent vs transposition persistent,  $P = .14$ ; decompression recurrent vs transposition recurrent,  $P = .66$ ).

## Discussion

Carpal tunnel syndrome is the most frequently encountered entrapment neuropathy. As a result, carpal tunnel decompression is the most common surgical procedure performed on the hand.<sup>8,13</sup> Although complications are rare, the incidence in which patients do not report a complete resolution of their symptoms is reported to range from 4% to 25%. Persistent symptoms following surgery are thought to be due to an inadequate release of the TCL, whereas recurrent symptoms are more often thought to be due to scarring of the median nerve.<sup>1,6,7,13,14,17</sup> Scarring of the median nerve interferes with physiologic gliding during wrist motion, and

**Table 1.** Patient Demographics and Procedure Type.

	Decompression (n = 17)	Transposition (n = 16)	P value
Body mass index, mean (SD)	32.7 (7.4)	35.6 (11.3)	.45
Age, mean (SD)	52.4 (10.4)	57.2 (14.6)	.29
Years since primary, mean (SD)	9.5 (9.5)	3.0 (3.3)	.11
Sex, n (%)			
Men	7 (41)	9 (56)	.61
Women	10 (59)	7 (44)	
Hand, n (%)			
Left	5 (29)	5 (31)	1.0
Right	12 (71)	11 (69)	
Diabetes, n (%)			
No	14 (82)	14 (88)	1.0
Yes	3 (18)	2 (12)	
Hypertension, n (%)			
No	11 (65)	5 (31)	.08
Yes	6 (35)	11 (69)	
Hypothyroidism, n (%)			
No	14 (82)	15 (94)	.6
Yes	3 (18)	1 (6)	
Smoking, n (%)			
No	13 (76)	10 (63)	.47
Yes	4 (24)	6 (37)	

**Table 2.** Procedure Type and Boston Carpal Tunnel Questionnaire Scores.

	Decompression (n = 17)	Transposition (n = 16)	95% CI	P value
Total score, mean (SD)	9.53 (8.99)	16.88 (12.80)	-1.99 to 15.0	.09
Symptom severity, mean (SD)	0.84 (0.81)	1.54 (1.18)	-0.09 to 1.39	.07
Functional status, mean (SD)	1.12 (1.36)	1.50 (1.32)	-1.14E-5 to 1.00	.35

Note. CI = confidence interval.

it is believed that simple repeat decompression with neurolysis is not always sufficient enough to prevent new scar formation. For these cases, a hypothenar fat pad transposition is often performed. The purpose of fat pad interposition is to act as a barrier between the median nerve and the surrounding tissue, decreasing the chance of scar tissue adhering to the median nerve.<sup>2,6,12,13,16</sup> Many studies have been performed describing good outcomes for patients undergoing revision CTR using fat pad interposition; however, no study has been performed by directly comparing fat pad interposition with simple decompression.<sup>2,5,12,16</sup> In this study, we sought to directly compare the 2 methods as well as use the validated Boston Carpal Tunnel Questionnaire (BCTQ) to assess outcomes.

Over the 12-year study period, a total of 1973 CTRs were performed at our institution, with a revision rate of 4.5%. This number correlates with the reported rate in the literature.<sup>1</sup> In our study, we did not see a difference in outcomes in patients undergoing simple decompression when

compared with decompression with fat pad interposition. Although not statistically significant, patients undergoing decompression alone had a trend toward better overall BCTQ scores and symptom severity scores with no difference in functional scores. Although the argument can be made that the decision to perform repeat decompression with versus without fat pad interposition is made intraoperatively based on findings such as median nerve scarring or incomplete release of the TCL, there have been no studies to our knowledge that show a correlation of either treatment group having improved outcomes based on the type of revision surgery performed. In addition, there have not been any studies showing that scarring of the median nerve or incomplete release of the TCL results in recurrent or persistent carpal tunnel syndrome. Furthermore, it is our belief that these intraoperative findings are very subjective.

This study has a few limitations including the retrospective nature of the study and its small sample size due to the low rate of recurrent carpal tunnel syndrome in the general

population. There is also the potential for recall bias on behalf of the patients when completing the BCTQ survey. A large prospective randomized multicentered study would be necessary to truly determine whether there is a difference in outcomes between the 2 procedures.

In conclusion, our study results indicate that the routine use of hypothenar fat pad transposition for revision carpal tunnel surgery in patients with persistent or recurrent symptoms following primary decompression may provide no benefit in patient outcomes. The significance of intraoperative findings including median nerve scarring and apparent incomplete release is yet to be elucidated; however, excellent results have been reported in our study and prior studies with both procedures. While we cannot go as far as to make a recommendation for or against the use of the hypothenar fat pad transposition based on the results of our study, we call into question the necessity of commonly performed supplementary procedures for the treatment of recurrent or persistent carpal tunnel syndrome.

### Ethical Approval

This study was approved by our institutional review board.

### Statement of Human and Animal Rights

Written consent was obtained from Pennsylvania State University institutional review board. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

### Statement of Informed Consent

Informed consent was obtained from all individual participants included in the study.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

### References

1. Chrysopoulou MT, Greenberg JA, Kleinman WB. The hypothenar fat pad transposition flap: a modified surgical technique. *Tech Hand Up Extrem Surg*. 2006;10(3):150-156.
2. Craft RO, Duncan SFM, Smith AA. Management of recurrent carpal tunnel syndrome with microneurolysis and the hypothenar fat pad flap. *Hand (N Y)*. 2007;2(3):85-89.
3. Dahlin LB, Lekholm C, Kardum P, et al. Coverage of the median nerve with free and pedicled flaps for the treatment of recurrent severe carpal tunnel syndrome. *Scand J Plast Reconstr Surg Hand Surg*. 2002;36(3):172-176.
4. Fajardo M, Kim SH, Szabo RM. Incidence of carpal tunnel release: trends and implications within the United States ambulatory care setting. *J Hand Surg Am*. 2012;37(8):1599-1605.
5. Fusetti C, Garavaglia G, Mathoulin C, et al. A reliable and simple solution for recalcitrant carpal tunnel syndrome: the hypothenar fat pad flap. *Am J Orthop (Belle Mead NJ)*. 2009;38(4):181-186.
6. Giunta R, Frank U, Lanz U. The hypothenar fat-pad flap for reconstructive repair after scarring of the median nerve at the wrist joint. *Chir Main*. 1998;17(2):107-112.
7. Hunter JM, Read RL, Gray R. Carpal tunnel neuropathy caused by injury: reconstruction of the transverse carpal ligament for the complex carpal tunnel syndromes. *J Hand Ther*. 1993;6(2):145-151.
8. Jones NF, Ahn HC, Eo S. Revision surgery for persistent and recurrent carpal tunnel syndrome and for failed carpal tunnel release. *Plast Reconstr Surg*. 2012;129(3):683-692.
9. Karthik K, Nanda R, Stothard J. Recurrent carpal tunnel syndrome—analysis of the impact of patient personality in altering functional outcome following a vascularised hypothenar fat pad flap surgery. *J Hand Microsurg*. 2012;4(1):1-6.
10. Kulick MI, Gordillo G, Javidi T, et al. Long-term analysis of patients having surgical treatment for carpal tunnel syndrome. *J Hand Surg Am*. 1986;11(1):59-66.
11. Levine DW, Simmons BP, Koris MJ, et al. A self-administered questionnaire for the assessment of severity of symptoms and functional status in carpal tunnel syndrome. *J Bone Joint Surg Am*. 1993;75(11):1585-1592.
12. Mathoulin C, Bahm J, Roukoz S. Pedicled hypothenar fat flap for median nerve coverage in recalcitrant carpal tunnel syndrome. *Hand Surg*. 2000;5(1):33-40.
13. Plancher KD, Idler RS, Lourie GM, et al. Recalcitrant carpal tunnel. The hypothenar fat pad flap. *Hand Clin*. 1996;12(2):337-349.
14. Pülzl P, Estermann D, Piza-Katzer H. Surgical treatment of persisting and recurrent carpal tunnel syndrome from 1999 to 2003. *Handchir Mikrochir Plast Chir*. 2006;38(5):300-305.
15. Soltani AM, Allan BJ, Best MJ, et al. A systematic review of the literature on the outcomes of treatment for recurrent and persistent carpal tunnel syndrome. *Plast Reconstr Surg*. 2013;132(1):114-121.
16. Strickland JW, Idler RS, Lourie GM, et al. The hypothenar fat pad flap for management of recalcitrant carpal tunnel syndrome. *J Hand Surg Am*. 1996;21(5):840-848.
17. Stütz N, Gohritz A, van Schoonhoven J, et al. Revision surgery after carpal tunnel release—analysis of the pathology in 200 cases during a 2 year period. *J Hand Surg Br*. 2006;31(1):68-71.
18. Teoh LC, Tan PL. Endoscopic carpal tunnel release for recurrent carpal tunnel syndrome after previous open release. *Hand Surg*. 2004;9(2):235-239.
19. Zuo D, Zhou Z, Wang H, et al. Endoscopic versus open carpal tunnel release for idiopathic carpal tunnel syndrome: a meta-analysis of randomized controlled trials. *J Orthop Surg Res*. 2015;10:12.