Early Revision Rate Following Primary Carpal Tunnel Release

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INTRODUCTION:

Carpal tunnel syndrome (CTS) is the most common compressive neuropathy diagnosed in the upper extremity, with a prevalence of 3.7% in the general U.S. population. The revision rate after carpal tunnel release (CTR) is poorly understood, with currently published rates in the literature ranging widely from 0.3 to 7%. The purpose of this study was to determine the rate of revision CTR following primary CTR at a single, large, multi-center orthopaedic hand surgery practice. It was hypothesized that the rate of revision CTR would be lower than recently reported rates.

METHODS:

We identified all patients who underwent primary CTR at a single orthopaedic practice by 18 fellowship-trained orthopaedic hand surgeons from 10/1/2015 through 10/1/2020, using a combination of CPT and ICD-10 codes. Patients who underwent CTR due to a diagnosis other than primary CTS were excluded. Following stringent database review, operative and outpatient clinic notes were reviewed in all patients requiring revision CTR to determine the cause for revision, outlined in Figure 1. All patients had a minimum of one year of chart follow-up. Patient demographics, surgical technique (open vs. endoscopic), and a history of co-morbidities associated with higher risk for CTS were collected. Multivariate logistic regression was planned to determine potential associations of risk factors with revision. Continuous data were compared using two-sample t-tests and categorical data were compared using chi-square tests.

RESULTS:

A total of 11,847 primary CTR procedures were performed during the 5-year period on 9,310 patients. The overall cohort consisted of 79.5% open CTR and 20.5% endoscopic CTR. We found 24 revision CTR procedures among 23 patients, resulting in a revision rate of 0.2%. The revision rate for primary open CTR was 0.23% (22 of 9422) as compared to 0.08% (2 of 2425) in the primary endoscopic CTR cohort (p=0.14). The average length of time from primary CTR to revision was 436 days (range 11-1647). Overall, the revision group was predominantly male (57% compared to 41% of overall cohort) and had a greater proportion of active smokers (30% vs. 14%), psychiatric conditions (44% vs. 22%), diabetes mellitus (22% vs. 15%), RA (17% vs. 10%), cervical spine disease (9% vs. 3%), and other median neuropathy (4.3% vs. 0.3%) (Table 1). The indication for revision in each of the 24 cases is described in Table 2. Unfortunately, the small size of the revision cohort (n=23 patients) precluded the use of multivariate analysis to describe the effect of surgical technique and comorbidities on revision rate.

DISCUSSION AND CONCLUSION:

Our study noted a substantially lower rate of early revision carpal tunnel release (0.2% overall; 0.11% within one year) than previously published studies. While time elapsed from primary CTR to revision is variable, the overwhelming majority of revision surgery is performed within 1-2 years of the patient's primary release. No statistically significant difference in revision rate was noted between our open CTR cohort and our single-portal endoscopic CTR cohort. These findings will allow us to better counsel patients considering CTR surgery.

Figure 1. Study Cohort Flow Diagram

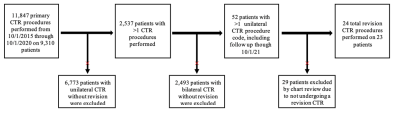

Table 1. Patient Demographics

CTR Data Per Patient	Primary CTR without revision		Primary CTR with revision CTR	
Total Patients	n = 9287		n = 23	
Variable	n	%	n	%
Gender				
Male	3817	41.1	13	56.5
Female	5470	58.9	10	43.5
Age				
Average	64.8	-	59.1	-
Range	21-103	-	33-80	-
BMI				
<25	1636	17.6	6	26.1
25-29.9	2926	31.5	3	13.0
>29.9	4345	46.8	10	43.5
Surgical Approach				
Open	7465	80.4	21	91.3
Endoscopic	1822	19.6	2	8.7
Tobacco Use				
Current	1310	14.1	7	30.4
Former	1929	20.8	1	4.3
Nonsmoker	3730	40.2	8	34.8
Comorbidities				
DM (Type 1 or 2)	1424	15.3	5	21.7
Thyroid disease	1239	13.3	3	13.0
Psychiatric Conditions	2046	22.0	10	43.5
Rheumatoid Arthritis	892	9.6	4	17.4
Cervical Disease	304	3.3	2	8.7
Ulnar Neuropathy	740	8.0	4	17.4
Other Median Neuropathy	30	0.3	1	4.3

Table 2: Revision CTR Patient Details

Patient ID	Laterality	Days to revision	Pre-op EMG	Pre-Revision EMG	Same Surgeon?	Primary Approach	Revision Approach	Reason for Revision	Concomitant Procedures
1	Right	421	Yes	Equivalent	No	Open	Open	Recurrent symptoms	N/a
2	Left	43	Yes	N/a	Yes	Open	Open	Worsening symptoms with pain	Forearm flexor tenosynovectomy
3	Right	1647	Yes	Equivalent	Yes	Open	Open	Recurrent symptoms	CuTR, Ulnar nerve release at wrist, flexor pronator lengthening
4	Left	840	Yes	Equivalent	Yes	Open	Open	Recurrent symptoms	Pedicled synovial flap
5	Right	434	Yes	Equivalent	Yes	Open	Open	Recurrent symptoms	Hypothenar fat flap
6	Right	112	Yes	N/a	Yes	Endoscopic	Open	Recurrent symptoms	N/a
7	Right	805	Yes	Equivalent	Yes	Open	Open	Persistent symptoms	Nerve wrap
8	Right	175	Yes	Equivalent	Yes	Endoscopic	Open	Persistent symptoms	CuTR
9	Left	1125	Yes	Mild improvement	Yes	Open	Open	Recurrent symptoms	Long finger TFR, Revision Ulnar N transposition
10	Right	134	Yes	Equivalent	Yes	Open	Open	Persistent symptoms	Forearm flexor tenosynovectomy
11	Right	302	Yes	More severe	Yes	Open	Open	Persistent symptoms	Hypothenar fat flap
12	Right	425	Yes	Equivalent	Yes	Open	Open	Persistent symptoms	Median nerve neurolysis at elbow, Lacertus release
13	Right	168	Yes	Equivalent	Yes	Open	Open	Persistent symptoms	Forearm flexor tenosynovectomy
14	Left	90	Yes	More severe	Yes	Open	Open	Recurrent symptoms	Hypothenar fat flap
15	Left	427	Yes	N/a	Yes	Open	Open	Recurrent symptoms	N/a
16	Left	131	Yes	More severe	Yes	Open	Open	Recurrent symptoms	Pedicled synovial flap
17	Left	11	Yes	N/a	Yes	Open	Open	Worsening symptoms with pain	N/a
18	Right	245	Yes	Equivalent	Yes	Open	Open	Persistent symptoms	Nerve wrap
19	Right	90	Yes	N/a	Yes	Open	Open	Recurrent symptoms	Nerve wrap
20 Left	Left	285	Yes	N/a	Yes	Open	Open	Recurrent symptoms	N/a
20 Right	Right	279	Yes	N/a	Yes	Open	Open	Recurrent symptoms	N/a
21	Left	1113	Yes	Equivalent	Yes	Open	Open	Recurrent symptoms	Hypothenar fat flap
22	Left	651	Yes	N/a	Yes	Open	Open	Recurrent symptoms	Ring TFR, Revision CuTR
23	Right	524	Yes	Equivalent	Yes	Open	Open	Recurrent symptoms	N/a