The Efficacy of Thread Carpal Tunnel Release for Carpal Tunnel Syndrome in Workers' Compensation Patients: A Prospective Multicenter Analysis.

Erik Gerlach, Mark A Plantz, Bejan Alvandi[1], Dru Z Curtis, Kelly Wun, John Carney, Corey Allen Jones, Jeremy S Marx[2], Andrew Zelby
[1]Northwestern Memorial Hospital, [2]Northwestern Medical Center

INTRODUCTION:

Vocation and worker's compensation are two variables that have been shown to influence long-term outcomes following carpal tunnel release surgery. The ultra-minimally invasive ultrasound guided percutaneous thread carpal tunnel release (TCTR) has been shown to be an effective alternate surgical technique for carpal tunnel release. The aim of this study is to investigate patient reported outcome measures and complications following TCTR in a large prospective cohort – and assess for any differences in outcomes among patients with worker's compensation status.

METHODS:

877 patients who underwent elective TCTR for CTS diagnosed based on history, physical exam and electromyography (EMG) studies between December 1, 2018 and June 30, 2021 at a multi-center single private institution were prospectively studied. Various demographic, surgical, and patient variables, including vocation, were reported (Table 1). Forty-five patients in the cohort had worker's compensation status. The Boston Carpal Tunnel Questionnaire (BCTQ) was used to assess patient symptom severity and functional status to measure outcomes pre-operatively, and at 3-months, 6-months, 1-year, and 2-years post-operatively. Physical exam metrics, including Phalen and Tinel's tests, two-point discrimination, and monofilament sensation, among others were collected pre-operatively and post procedure at 3-months.

RESULTS:

Patient demographics are reported in (table 1). Physical exam and history variables at 3 months post-procedure improved significantly and there were no differences between those with and without worker's compensation status (Table 2). The mean improvement in total BCTQ score at 2 years post-operatively was: 19.0 ± 9.5 and 28.8 ± 14.5 in patients with and without worker's compensation, respectively ($p=0.082$). The mean improvement in symptom severity scale (SSS) subscore at 2 years was 13.2 ± 7.2 and 20.2 ± 9.1 in patients with and without worker's compensation, respectively ($p=0.094$). The mean improvement in function severity scale (FSS) sub-score was actually higher in patient's with worker's compensation at 6 months post-operatively ($p=0.016$). However, there was no difference in this sub-score at 2 years post-operatively (Table 3). Overall, the rate of complications after TCTR was low. The most common complications within the 7-day follow up period included extensive ecchymosis (0.9%), post-procedure pain (1.4%) noted as "severe" on a scale of mild-to-moderate-to-severe, and a subclinical superficial surgical puncture site infection in one patient (0.1%) that resolved without antibiotic therapy. Common complications within the 3- month follow up period were puncture site skin thickening (1.1%) and pillar pain (2.1%). Only 1 patient (0.1%) had persistent post-surgical median nerve neuropathy requiring a repeat TCTR procedure for inadequate release approximately 7 months after the index procedure (Table 4).

DISCUSSION AND CONCLUSION:

This study assessed the largest known prospective cohort of patients undergoing the ultra-minimally invasive TCTR procedure to date. By minimizing damage to the skin and transverse carpal ligament, TCTR provides an effective means for treating carpal tunnel syndrome, while reducing the risk of complications, including pillar pain and scar complications. Patients with worker's compensation status had similar patient-reported outcomes relative to control patients at 2 years post-operatively. This study demonstrates the effectiveness of the TCTR procedure in a population that is historically at risk of worse outcomes.

Table 1. Demographics

	# Patients (%) [N=877]
Sex	
Female	395 (45.0%)
Male	482 (55.0%)
Age	
18-40 years	93 (10.6%)
40-50 years	180 (20.5%)
50-60 years	275 (31.4%)
60-70 years	182 (20.8%)
70-80 years	115 (13.1%)
80+ years-old	32 (3.6%)
BMI	
Underweight	2 (0.2%)
Normal	109 (12.4%)
Overweight	244 (27.8%)
Obese Class I	230 (26.2%)
Obese Class II	100 (11.4%)
Obese Class III	192 (21.9%)
Comorbidities	
Chronic Steroid Use	22 (2.5%)
Nicotine Products	92 (10.5%)
Smoking	89 (10.1%)
Hypertension	303 (34.5%)
Diabetes	110 (12.5%)
Hypothyroidism	80 (9.1%)
Rheumatoid Arthritis	29 (3.3%)
Endocrinopathies	11 (1.3%)
ASA Class	
Class I	145 (16.5%)
Class II	612 (69.8%)
Class III+	120 (13.7%)
Workman's Compensation	45 (5.1%)
Payment	
Self-pay	228 (26.0%)
Medicare	129 (14.7%)
Private Insurance	520 (59.3%)

Table 4. Post-Procedure Complications

	# Patients (%) [N=809]
Surgical site infection	
Superficial skin infection	1 (0.1%)
Deep space infection	0 (0.0%)
Post-procedure extensive ecchymosis	8 (0.9%)
Post-procedure hematoma	0 (0.0%)
Puncture site scar tenderness	4 (0.5%)
Puncture site skin thickening	10 (1.1%)
Skin neuropraxia	0 (0.0%)
Median nerve neuropraxia	0 (0.0%)
Reflex sympathetic dystrophy (CRPS)	0 (0.0%)
Sensory cutaneous neuroma	0 (0.0%)
Injury to recurrent motor branch	0 (0.0%)
Tenosynovitis of flexor tendons	0 (0.0%)
Pain	
Pillar pain at 3-months	19 (2.1%)
Post-procedure pain within 7 days	
Mild	717 (81.7%)
Moderate	80 (9.1%)
Severe	12 (1.4%)
Incomplete documentation	68 (7.7%)
Inadequate release requiring repeat TCTR	1 (0.1%)

Table 2. Physical Exam Measures at 3-months

	Workers Comp [n=45]	Control [n=731]	P
Nocturnal Symptoms			
Same	0 (0.0%)	3 (0.4%)	0.285
Improved	2 (4.4%)	27 (3.7%)	
Absent	33 (73.3%)	520 (71.1%)	
Not Reported	10 (22.2%)	181 (24.8%)	
Numbness/Tingling Relief			
Same	0 (0.0%)	5 (0.7%)	0.229
Improved	8 (17.8%)	157 (21.5%)	
Absent	27 (60.0%)	388 (53.1%)	
Not Reported	10 (22.2%)	181 (24.8%)	
Positive Phalen's Test	2 (4.4%)	20 (2.7%)	0.290
Positive Tinel's Test	0 (0.0%)	34 (4.7%)	0.184
Monofilament Testing			
Normal	20 (44.4%)	309 (42.3%)	0.423
Decreased	3 (6.7%)	84 (11.5%)	
Not Reported	22 (48.9%)	338 (46.2%)	

Table 3. Mean Improvement in Boston Carpal Tunnel Questionnaire Outcome Measures

	Workers Comp [n=45]	Control [n=731]	P
6 Months Post-Op:			
Δ Total Score	30.5 ± 15.9	26.5 ± 14.3	0.221
Δ Symptom severity scale (SSS)	19.2 ± 10.2	18.2 ± 9.3	0.332
Δ Functional status scale (FSS)	11.4 ± 6.9	8.3 ± 6.6	**0.016**
1 Year Post-Op:			
Δ Total Score	24.5 ± 11.1	26.8 ± 14.2	0.239
Δ Symptom severity scale (SSS)	14.9 ± 7.3	18.6 ± 9.2	0.378
Δ Functional status scale (FSS)	9.6 ± 5.4	8.2 ± 6.6	0.097
2 Years Post-Op:			
Δ Total Score	19.0 ± 9.5	28.8 ± 14.5	0.082
Δ Symptom severity scale (SSS)	13.2 ± 7.2	20.2 ± 9.1	0.094
Δ Functional status scale (FSS)	5.8 ± 3.03	8.6 ± 6.8	0.111