Relationship between Smoking and Outcomes after Cubital Tunnel Release

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J Hand Microsurg 2018;10:12–15

Abstract

Purpose Several studies have drawn a connection between cigarette smoking and cubital tunnel syndrome. One comparison article demonstrated worse outcomes in smokers treated with transmuscular transposition of the ulnar nerve. However, very little is known about the effect that smoking might have on patients who undergo ulnar nerve decompression at the elbow. The purpose of this study is to evaluate the effect of smoking preoperatively on outcomes in patients treated with ulnar nerve decompression.

Materials and Methods This study used a survey developed from the comparison article with additional questions based on outcome measures from supportive literature. Postoperative improvement was probed, including sensation, strength, and pain scores. A thorough smoking history was obtained. The study spanned a 10-year period.

Results A total of 1,366 surveys were mailed to former patients, and 247 surveys with adequate information were returned. No significant difference was seen in demographics or comorbidities. Patients who smoked preoperatively were found to more likely relate symptoms of pain. Postoperatively, nonsmoking patients generally reported more favorable improvement, though these findings were not statistically significant.

Conclusion This study finds no statistically significant effect of smoking on outcomes after ulnar nerve decompression. Finally, among smokers, there were no differences in outcomes between simple decompression and transposition.

Keywords

- smoking
- ulnar nerve
- cubital tunnel

Introduction

Chronic ulnar nerve neuritis was first described in 1922 by Buzzard.¹ Since then, cubital tunnel syndrome has become the second most common peripheral neuropathy. It has varied in treatment from simple decompression to medial epicondylectomy to transposition of the nerve.^{2,3} Many factors have been identified as possible causes of the neuropathy including holding a tool in position and obesity as well as stressful environments.^{4,5}

Several sources of literature draw a connection between cigarette smoking and cubital tunnel syndrome.^{6–8} One study published 14 years ago demonstrated a worse outcome in

smokers treated with transmuscular transposition of the ulnar nerve.⁹ Very little is known, however, about the effect that smoking might have on patients who undergo ulnar nerve decompression at the elbow.

The purpose of this study is to evaluate outcomes in patients treated at the Indiana Hand to Shoulder Center with ulnar nerve decompression surgery and determine whether a smoking history at the time of surgery affected improvement.

The null hypothesis of this study is that there is no difference in outcomes between smokers and nonsmokers who have undergone cubital tunnel release surgery.

Only one study was identified in a medline literature search that provides information on outcomes of cubital

received

June 2, 2017

accepted after revision

October 9, 2017

published online

March 20, 2018

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DOI <https://doi.org/10.1055/s-0037-1618329>.
ISSN 0974-3227.

tunnel surgery and relation to smoking. This study published by Drs. Novak, Mackinnon, and Stuebe mailed a survey to which 100 patients responded at an average of 37 months after their surgery. The survey was directed to identify outcomes after a specific technique for intramuscular transposition, and smoking history was one of the questions analyzed. Their findings note statistically significant worse outcomes in smokers, although the paper is unclear about which primary outcome is used to determine the poor result.

Materials and Methods

This study used a survey developed from the Novak and Mackinnon publication with some additional questions based on outcome measures from supportive literature including the Amadio classification and the Kleinman/Bishop classification. Although the McGowan and Amadio classifications are commonly referenced (among many others), it is worth noting that no outcome measures specific for cubital tunnel syndrome are validated.

Recently, the SUN study group has looked carefully at outcome measurement tools possibly related to cubital tunnel syndrome and decompression surgery, including the Michigan Hand Outcomes Questionnaire (MHQ), Disabilities of the Arm, Shoulder and Hand (DASH), and Carpal Tunnel Questionnaire (CTQ).¹⁰ Their publications present a likely and reasonable outcome tool for cubital tunnel surgery. Inadequate data records for these patients do not allow for evaluation of these outcomes questionnaires in this study.

The focus questions are the main outcome points that ask a patient about their postoperative improvement. After surgery, is their sensation and strength improved? Do they consider their sensation and strength to be normal? Visual analog scale (VAS) pain scores were requested and reported. Also, given their result after surgery, would they choose to undergo the same surgery again? Further, a thorough smoking history is obtained. This includes smoking at the time of surgery as well as current smoking, packs per day, years of smoking, and hand used for smoking.

Institutional review board approval was obtained for this study, and diagnosis and billing codes were used to generate a list from a 10-year period. More than 3,500 patients were initially identified including patients treated with nerve decompression for any reason. This number was reduced

to include patients undergoing only cubital tunnel surgery. With this list, 1,366 surveys were mailed to former patients.

All surgeries were performed by hand and upper extremity fellowship trained surgeons. Nine surgeons were included in the study. Only open cubital tunnel releases performed. No releases were performed endoscopically.

Statistical analysis was performed on the results. Demographic data were analyzed using paired *t*-test, and regression analysis for treatment was done with analysis of covariance (ANCOVA).

Results

There were 247 surveys with adequate information returned, representing 227 patients (20 of which had bilateral surgery on different days) from 9 surgeons. This provided an 18.1% response rate. Seventeen patients chose not to include their names; however, their data were included as anonymous feedback with enough critical information included.

As shown in ►Table 1, the results show no difference in demographics comparison between smoking and non-smoking groups. ►Table 2 demonstrates the relationship that both smokers and nonsmokers have with preoperative symptoms of small finger pain, tingling, and numbness. Note that patients who smoked at surgery were more likely to relate symptoms of pain than their nonsmoking counterparts. They also reported paresthetic symptoms more commonly, although these are not statistically significant.

Findings in postoperative symptoms (►Table 3) demonstrate that current sensation and strength are often improved after ulnar nerve decompression. Observation of the data of nonsmoking patients shows a trend toward more favorable improvement in sensation, strength, and pain. These findings, however, did not reach statistical significance.

►Table 4 displays demographic results in patient who smoke comparing simple in situ decompression with anterior transposition of any kind. Note that no statistical difference exists between the groups regarding age, follow-up, sex, dominant hand, body mass index (BMI), workers compensation, and diabetes. ►Table 5 also compares in situ decompression and transposition patients and their preoperative symptoms of small finger pain, tingling, and numbness. No difference is observed between groups preoperatively.

Findings in postoperative symptoms of smokers show no trends overall in favor of in situ or transposition surgery.

Table 1 Demographics of smokers versus nonsmokers

	Nonsmokers (n = 204)	Smokers (n = 43)	p-Value
Mean age (y)	53.1	51.7	0.5
Mean follow-up (mo)	84.3	78.0	0.4
Percent female	46.8%	59.5%	0.17
Percent dominant surgery	56.1%	42.5%	0.16
Body mass index	29.2	28.5	0.6
Percent workers compensation	14.2%	17.1%	0.63
Diabetes	14.7%	14.3%	1.00

Table 2 Preoperative symptoms of smokers versus nonsmokers

	Nonsmokers (n = 204)	Smokers (n = 43)	p-Value
Small finger pain	44.3%	69.1%	0.006
Small finger tingling	74.9%	80.0%	0.63
Small finger numbness	80.4%	92.5%	0.11

Table 3 Postoperative symptoms of smokers versus nonsmokers

	Nonsmokers (n = 204)	Smokers (n = 43)	p-Value
Current sensation improved	78.1%	69.8%	0.40
Normal sensation	61.5%	48.8%	0.19
Current strength improved	55.3%	55.8%	0.93
Normal strength	59.0%	47.5%	0.22
Pain score	2.6	3.4	0.47

Table 4 Demographics of smokers treated with in situ decompression versus transposition

	In situ (n = 13)	Transposition (n = 14)	p-Value
Mean age (y)	53.6	49.9	0.45
Mean follow-up (mo)	72.5	69.4	0.85
Percent female	53.8%	28.6%	0.25
Percent dominant surgery	46.2%	53.8%	1
Body mass index	28.3	27.4	0.71
Percent workers compensation	8.3%	30.8%	0.32
Diabetes	23.1%	7.1%	0.33

Table 5 Preoperative symptoms of smokers treated with in situ decompression versus transposition

	In situ (n = 13)	Transposition (n = 14)	p-Value
Small finger pain	69.2%	64.3%	1.00
Small finger tingling	75.0%	69.2%	1.00
Small finger numbness	100%	76.9%	0.22

Table 6 Postoperative symptoms of smokers treated with in situ decompression versus transposition

	In situ (n = 13)	Transposition (n = 14)	p-Value
Current sensation improved	61.5%	71.4%	0.85
Normal sensation	54.5%	50.0%	1.00
Current strength improved	53.9%	50.0%	0.72
Normal sensation	38.5%	45.5%	1.00
Pain score	4.2	3.7	0.42

Again, these findings are not statistically significant, further detailed in ►Table 6.

Discussion

A 2009 meta-analysis study by Macadam et al reviewed several measurement tools of cubital tunnel outcomes.¹¹ They identified all outcomes tools, in publication, with adequate information to allow for evaluation of validity and reproducibility. Many are specific for cubital tunnel. Others are generic measurement tools (such as the Disabilities of the Arm, Shoulder and Hand questionnaire [DASH]). Their findings

show that no reliable, reproducible, and valid outcomes tools exist in surgical literature for evaluation of ulnar nerve compression at the elbow following surgery.

More recently, the SUN study group has evaluated the use of the MHQ, DASH, and CTQ in the treatment of ulnar nerve in situ decompression at the elbow. Their findings show that, to varying degrees, all three questionnaires correlate well with symptom relief and outcomes after surgery. The difference necessary to show a clinically important change is small and reproducible. Those with more severe symptoms for less than 3 months prior to surgery have better outcomes, and most postoperative gains are appreciated within 3 months after surgery.

However, to date, this evaluation has only been completed in simple decompression, not transposition surgery. Their publications are a productive step in identifying a useful measurement tool in the treatment of cubital tunnel syndrome.

If a difference in outcomes is noted in smoking patients, there is question as to the reason for this difference. One theory might be that vasoconstriction from smoking in conjunction with altered vascularity of the nerve in transposition surgery leads to worse outcomes. This would be in contrast to in situ decompression with the extrinsic blood supply largely unaltered. In comparison of this study with the referenced Novak and MacKinnon article from 2002, outcomes were quite similar. This study included more than double the patients as the comparison article. Those who reported improvement or lack thereof after surgery is similar, as is the amount who would repeat the surgery given their outcome. The one significant difference in findings is the report of worse outcomes in smokers in their study compared with no statistically significant difference in this group. Again, it is noted that the 2002 reference paper gave no information about how improvement was calculated, nor were the statistical differences seen between smokers and nonsmokers.

At the conclusion of this study, the authors accept the null hypothesis that there is no difference in outcomes after ulnar nerve decompression surgery in smokers and nonsmokers. Although statistical significance is not found, some observational differences are seen that may have clinical implications. For example, smokers appear to express less favorable recovery of sensation and strength as well as maintaining more pain after surgical decompression. Caution should be exercised in accepting this observation, however, because no real difference is confirmed. The authors also conclude through observation that there is lack of an accepted outcome measurement tool that is reliable. Finally, among smokers, surgical decompression type was not different, suggesting that any variations in outcomes are likely not related to simple decompression versus transposition.

Conflict of Interest

None.

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