

Open Carpal Tunnel Release Outcomes: Performed Wide Awake versus with Sedation

Jacob E. Tulipan¹ Nayoung Kim^{1,2} Jack Abboudi^{1,2} Christopher Jones^{1,2} Frederic Liss^{1,2}
William Kirkpatrick^{1,2} Michael Rivlin^{1,2} Mark L. Wang^{1,2} Jonas Matzon^{1,2} Asif M. Ilyas^{1,2}

¹Department of Orthopaedic Surgery, Thomas Jefferson University, Philadelphia, Pennsylvania, United States

²Division of Hand Surgery, Rothman Institute, Philadelphia, Pennsylvania, United States

Address for correspondence Jacob E. Tulipan, MD, Department of Orthopaedic Surgery, Thomas Jefferson University, 1025 Walnut Street, Suite 516 College, Philadelphia, PA, United States (e-mail: jacob.tulipan@gmail.com).

J Hand Microsurg 2017;9:74–79.

Abstract

Background Carpal tunnel release (CTR) is the most common surgery of the hand, and interest is growing in performing it under local anesthesia without tourniquet. To better understand differences, we hypothesized that patients undergoing CTR under wide-awake local anesthesia with no tourniquet (WALANT) versus sedation (monitored anesthesia care [MAC]) would not result in a difference in outcome.

Methods Consecutive cases of electrodiagnostically confirmed open CTR across multiple surgeons at a single center were prospectively enrolled. Data included demographic data, visual analog scale, Levine-Katz carpal tunnel syndrome scale, QuickDASH questionnaire, customized Likert questionnaire, and complications.

Results There were 81 patients enrolled in the WALANT group and 149 patients in the MAC group. There were no reoperations in either group or any epinephrine-related complications in the WALANT group. Disability and symptom scores did not differ significantly between WALANT and sedation groups at 2 weeks or 3 months. Average postoperative QuickDASH, Levine-Katz, and VAS pain scales were the same in both groups. Both groups of patients reported high levels of satisfaction at 91 versus 96% for the WALANT versus MAC groups, respectively ($p > 0.05$). Patients in each group were likely to request similar anesthesia if they were to undergo surgery again.

Conclusion Patients undergoing open CTR experienced similar levels of satisfaction and outcomes with either the WALANT or MAC techniques. There was no statistically significant difference between either group relative to the tested outcome measures. These data should facilitate surgeons and patients' choosing freely between WALANT and MAC techniques relative to complications and outcomes.

Keywords

- ▶ carpal tunnel release
- ▶ sedation
- ▶ wide awake
- ▶ visual analog scale

Introduction

Carpal tunnel release (CTR) is one of the most commonly performed surgical procedures, with an estimated 160,000 surgeries performed in the United States in 2006 alone.¹ Given the high-volume nature of the procedure, efforts have been made to streamline the CTR procedure as a means

of cutting costs and reducing patient inconvenience. These efforts have included utilizing less invasive surgical techniques, moving the surgeries to outpatient facilities¹ and using portable hand tables to improve turnover time and efficiency, eliminating postoperative physical therapy² and postoperative splinting,³ and simplifying perioperative anesthesia.^{4,5} A 2015 study polled members of the American

received

February 19, 2017

accepted after revision

April 21, 2017

published online

May 22, 2017

© 2017 Society of Indian Hand & Microsurgeons

DOI <https://doi.org/10.1055/s-0037-1603200>.
ISSN 0974-3227.

Society of Surgeons of the Hand and found that 43% of respondents use intravenous sedation during CTR, whereas 8% perform the surgery with local anesthesia alone leaving the patient wide awake.⁶

The “wide-awake local anesthesia with no tourniquet” (WALANT) anesthesia technique has gained attention in recent years due to its convenience, cost-effectiveness,⁷⁻⁹ and high level of patient satisfaction.^{10,11} This technique eliminates the need for preoperative testing, perioperative anesthesia and monitoring, and postoperative anesthesia recovery, while allowing for adequate local surgical site anesthesia without the discomfort of a tourniquet for hemostasis. There have been few large-scale studies directly comparing outcomes using local anesthesia (WALANT) with the more commonly utilized sedation (monitored anesthesia care [MAC]) in CTR surgery. We hypothesize that the two anesthesia techniques will demonstrate equivalent outcomes and patient satisfaction.

Methods

All procedures 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. Informed consent was obtained from all patients for being included in the study. All patients undergoing CTR were prospectively and consecutively solicited to participate. Inclusion criteria included electrodiagnostically verified CTS (with evidence of increased median nerve latency or denervation) indicated for open CTR. Exclusion criteria included a patient younger than 18 years, endoscopic CTR, prior history of CTR surgery to the operative hand, CTR for acute or traumatic carpal tunnel syndrome (CTS), or if the CTR surgery was being performed with any other concomitant procedure (i.e., CTR along with a trigger finger release).

All surgeries were performed on an outpatient basis by one of eight fellowship-trained orthopedic hand surgeons. Anesthesia method was selected collaboratively by the patient and surgeon based on a conversation between the two, which is standard practice at our institution. Patients in the WALANT group received 1 cm³ of 8.4% bicarbonate and 9 cm³ of 1% lidocaine with epinephrine into the surgical site prior to prepping the patients. After prepping and draping, an additional 5 to 10 cm³ of 1% lidocaine with epinephrine was injected into the surgical site again, just prior to skin incision. Typically 10 to 20 minutes passed between the initial injection followed by the secondary injection and skin incision. Patients in the MAC group, after prepping and draping, were injected with 10 cm³ of 1% lidocaine without epinephrine into the surgical site before skin incision. Patients in the MAC group then also had their hand and arm exsanguinated with an esmarch and had the tourniquet inflated to 250 mm Hg.

All surgeries were performed utilizing a standard open technique with a 2- to 3-cm incision placed at the base of the volar hand in line with the third webspace. The incision was not extended proximal to the distal wrist flexion crease.

Table 1 Patient demographics

	WALANT	MAC	<i>p</i>
N	81	149	
Age	62.3	61.7	0.76
Female	44 (54)	91 (61)	
Male	37 (46)	58 (39)	
Right-sided surgery	50 (62)	90 (60)	
Left-sided Surgery	31 (38)	59 (40)	
Preoperative QuickDASH	44.6	42.1	0.47
Preoperative Levine-Katz symptom score	26.5	25.6	0.51
Preoperative Levine-Katz function score	14.9	14.1	0.49
Preoperative Levine-Katz total score	41.4	39.8	0.46

Abbreviations: MAC, monitored anesthesia care; QuickDASH, 10-question Disability of the Arm Shoulder and Hand (questionnaire); WALANT, wide-awake local anesthesia with no tourniquet.

Note: Demographic characteristics of the WALANT and MAC patient groups, expressed where applicable as number (%). QuickDASH and Levine Katz results are reported as mean scores.

Sharp dissection was taken down to the transverse carpal ligament, and a sharp release with a number 15 blade and tenotomy scissors were used to completely release the ligament. A neurolysis or other concomitant procedures about the nerve were not performed. Postoperatively, all patients were placed in a soft dressing and returned to the office by 2 weeks for reevaluation and suture removal. Repeat clinical evaluation was performed at 3 months and all questionnaires were repeated at each visit.

Data collected included demographic data (► **Table 1**), visual analog scale (VAS), Levine-Katz CTS scale, 10-question Disability of the Arm Shoulder and Hand (QuickDASH) questionnaire, a customized Likert scale (► **Tables 2-3**) and the Lalonde Carpal Tunnel Questionnaire.¹⁰ Descriptive statistics were performed using a *p* < 0.05 considered statistically significant.

Results

A total of 230 consecutive patients meeting the inclusion criteria were enrolled. The patient demographic data are included in ► **Table 1**. A total of 215 patients were available for follow-up at 2 weeks (93%), and 156 patients were available for final follow-up at 3 months (68%). There were no reoperations or readmissions in either group, nor any complications in either group.

Mean pre- and postoperative Levine-Katz (► **Fig. 1A**) scores for either the WALANT or MAC groups did not demonstrate statistical significance by Student's *t*-testing at any point. Similarly, mean pre- and postoperative

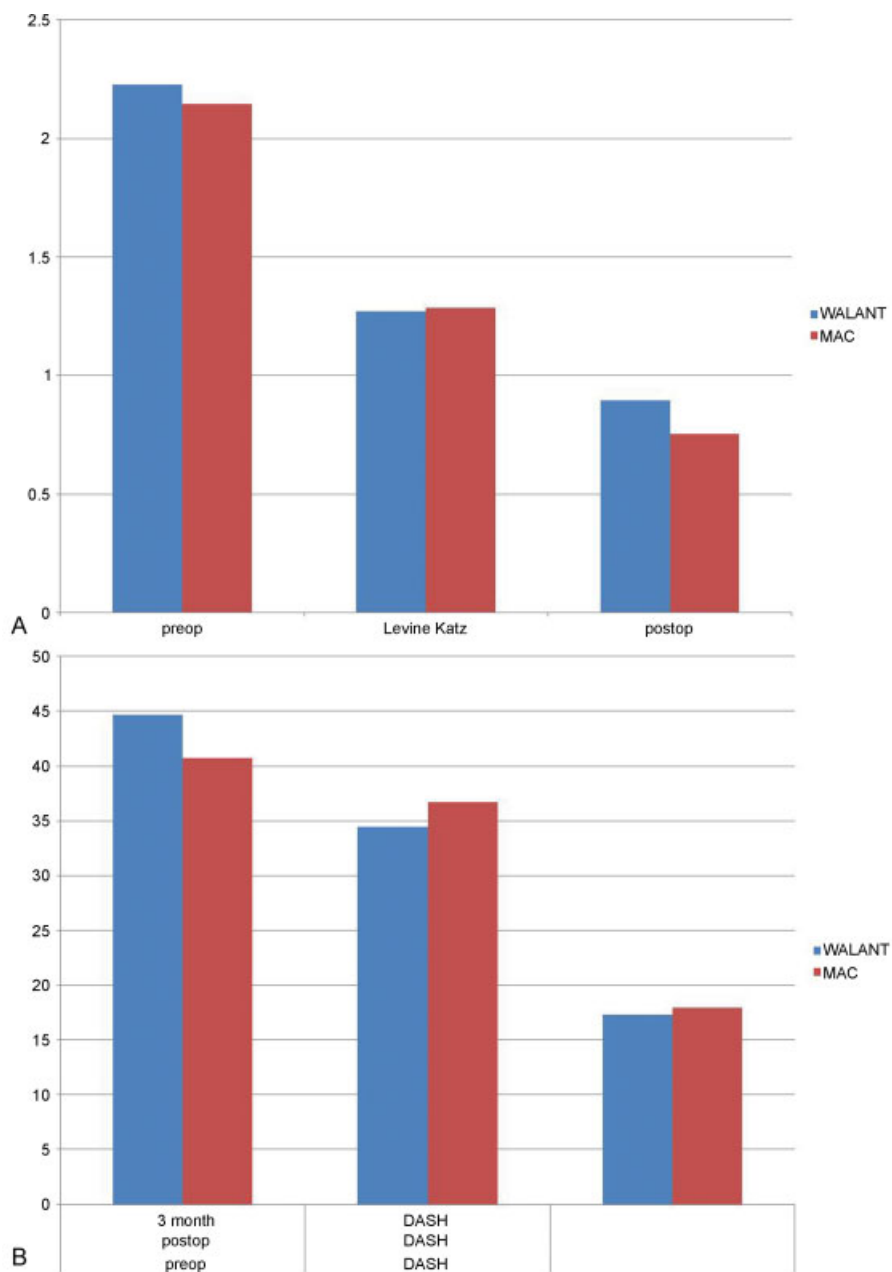


Fig. 1 Patient-centered outcome scores. (A) Levine-Katz CTS scale. Average Levine-Katz scale scores at the preoperative, 2-week postoperative, and 3-month postoperative time points. There were no statistically significant differences between groups at any of these points. (B) QuickDASH scores. Average QuickDASH scores at the preoperative, 2-week postoperative, and 3-month postoperative time points. There were no statistically significant differences between groups at any of these points. MAC, monitored anesthesia care; WALANT, wide-awake local anesthesia with no tourniquet.

QuickDASH (►Fig. 1B) scores for either the WALANT or MAC groups also did not demonstrate statistical significance by Student's *t*-testing at any point.

Responses to patient satisfaction Likert surveys are recorded in ►Table 2. At 3 months after surgery, 96% of WALANT patients and 94% of MAC patients were happy that they had undergone surgery. There were no statistically significant differences between groups in activity limitation due to incisional pain (►Table 2) or time to return to work (►Table 2). Patients in the MAC group reported significantly less pain at their 2 week follow-up,

but the groups demonstrated no difference at 3 months (►Table 2).

Responses to the Lalonde questionnaire are recorded in ►Table 3. In terms of adverse events, 6% of MAC patients reported postoperative nausea versus no patients in the WALANT group (►Table 3). Both groups were questioned as to whether they would prefer a similar or different anesthesia protocol if they underwent the procedure again. Within the MAC group, a larger proportion of patients state that they would have preferred deeper anesthesia than what they received (18% chose “completely asleep”) than in the

Table 2 Likert questionnaire results

	Are you happy that you had the surgery done?	2 wk	3 mo
WALANT	Yes	67 (92)	49 (96)
	No	6 (8)	2 (4)
	Total	73	51
MAC	Yes	137 (96)	99 (94)
	No	5 (4)	6 (6)
	Total	142	105
	How much does the incision in your palm limit your activities?	2 wk	3 mo
WALANT		2.62	1.64
MAC		2.77	1.72
<i>p</i> =		0.21	0.6
	How many days after the surgery were you able to return to work?	2 wk	
WALANT		3.79	
MAC		4.42	
<i>p</i> =		0.65	
	Visual analog scale	2 wk	3 mo
WALANT		2.32	1.55
MAC		1.8	1.61
<i>p</i> =		0.06	0.85

Abbreviations: MAC, monitored anesthesia care; WALANT, wide-awake local anesthesia with no tourniquet.

- a: Responses to question: “Are you happy that you had the surgery done?” Results are recorded as number (%) giving this response.
- b: Responses to question: “How much does the incision in your palm limit your activities?” Mean Likert Scores for pain-limiting activities. Responses given from 1 (not at all) to 5 (unable to use my hand). Results are reported as average score.
- c: Responses to question: “How many days after surgery were you able to return to work?” Results are reported as average score.
- d: VAS scores. Mean visual analog pain scores at postoperative visits. VAS pain scale is scored from 0 (no pain) to 10 (worst imaginable pain). Mean results are reported.

WALANT group (12% “chose sedated” or “asleep”). However, most patients in both groups (86% in WALANT, 67% in MAC group) would have undergone the same method of anesthesia again given the choice (– **Table 3**). Both groups reported roughly equal levels of preoperative anxiety (– **Table 3**).

Discussion

Our hypothesis—that there would be a minimal difference in operative outcomes and patient satisfaction between

Table 3 Lalonde questionnaire results

	Did you have any nausea after the surgery?	
WALANT	Yes	0 (0)
	No	73 (100)
	Total	73
MAC	Yes	9 (6)
	No	133 (94)
	Total	142
	<i>p</i> =	0.025
	If you were to have the same surgery again and given the choice, would you prefer to be awake for the surgery, sedated or completely asleep?	
WALANT	Awake	63 (86)
	Sedated	5 (7)
	Asleep	4 (5)
	Not sure	1 (1)
	Total	73
MAC	Awake	7 (5)
	Sedated	95 (67)
	Asleep	26 (18)
	Not sure	14 (10)
	Total	142
	How anxious were you about the carpal tunnel surgery before?	
WALANT	2.96	
MAC	3.31	
<i>p</i>	0.41	

Abbreviations: MAC, monitored anesthesia care; WALANT, wide-awake local anesthesia with no tourniquet.

- a: Responses to: “Did you have any nausea after the surgery?” Results are recorded as number (%) giving each answer.
- b: Responses to: “If you were to have the same surgery again and given the choice, would you prefer to be awake for the surgery, sedated, or completely asleep?” Results are recorded as number (%) giving each answer.
- c: Responses to: “How anxious were you about the carpal tunnel surgery before?” The patient’s recollection of preoperative anxiety, as measured at the 2-week postoperative visit. Responses given from 0 (not anxious) to 10 (most anxious). Results reported as mean score.

MAC and WALANT groups undergoing CTR—was confirmed, with no statistically significant difference noted between WALANT and MAC groups’ DASH or Levine-Katz scores at 2 weeks or 3 months postsurgery. The MAC group reported lower levels of postoperative pain at the 2-week visit, but pain scores were equivalent at the 3-month follow up.

Notably, the patients who underwent WALANT CTR were likely to state that they would select the same anesthesia again. Unexpectedly, a substantial portion of patients who

had MAC (30%) would have preferred to be under general anesthesia for the procedure. This proportion remained constant at the 3-month follow-up. The desire for more anesthesia contrasts with the high degree of patient satisfaction (MAC patients actually reported less pain at the 2-week time point) and may be more related to patient anxiety than the patient's operative experience. Additionally, as no patients actually underwent general anesthesia, it is unknown whether these patients would have preferred MAC or WALANT had they undergone general anesthesia; it is possible that they would not be completely satisfied with any of the anesthetic options. It is also possible that many patients were not offered general anesthesia as an option; given the associated risks and side effects, some surgeons prefer to use MAC or WALANT unless the patient specifically requests otherwise. Further research would be needed to determine what aspects of the experience patients would wish to improve by substituting general anesthesia for MAC.

A 2013 study by Davison et al compared patients of two surgeons, one performing open CTR with a local protocol and the other performing endoscopic CTR with an MAC protocol. This group found that the patients undergoing wide-awake surgery had lower preoperative anxiety levels, consistent with a self-selection bias.¹⁰ This study was limited, however, in that it varied both anesthesia and surgery protocol between groups. Furthermore, it did not track functional outcomes. In our study, patients reported high levels of satisfaction regardless of their chosen method of anesthesia, similar to the findings of Davison et al. However, our study also provided outcome findings and subsequent equivalence between WALANT and MAC protocols.

A 2014 study by Rozanski et al compared local anesthesia with or without sedation in minor hand surgery. While the study demonstrated very high levels of satisfaction in both groups with no significant difference between the two, the study only included 37 patients undergoing CTR. Furthermore, a tourniquet was used on all patients.¹²

This study has some weaknesses. First, there may be some selection bias as the patients were not randomized. Rather, patients were chosen for WALANT versus MAC based on a discussion between the patient and the physician. This may have resulted in selection bias relative to patient satisfaction, but it is not clear that it would alter the objective parameters of complications, VAS, DASH, and Levine-Katz scores. In addition, the study had a final follow-up rate of 68%. This is due in part to the post-operative protocols of some participating surgeons, in which patients were discharged from care before this time point if they were recovering without issue. However, the power of the study is impaired by the lower response numbers at 3 months and the results may be biased by retaining a higher proportion of dissatisfied patients at this time point. This study also made no attempt to factor in biopsychosocial issues known to affect satisfaction in CTR, including worker's compensation status, diagnosed anxiety

disorders and PTSD, and substance abuse. Without patient randomization, it is unknown whether these patients self-sorted into MAC or WALANT groups.

Our results indicate a high degree of patient satisfaction with CTR in both the MAC and WALANT study groups. Critically, based on several objective, patient-centered outcome scores, there was no difference between the WALANT and MAC groups. These findings can provide strong support for the equivalency of the two techniques and subsequently free the patient and surgeon to choose the anesthetic technique most comfortable for both parties.

Note

This study was conducted at Rothman Institute, Thomas Jefferson University, Philadelphia, Pennsylvania. 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 (5). Informed consent was obtained from all patients for being included in the study.

Funding

None.

Conflict of Interest

None.

References

- 1 Nguyen C, Milstein A, Hernandez-Boussard T, Curtin CM. The effect of moving carpal tunnel releases out of hospitals on reducing United States health care charges. *J Hand Surg Am* 2015;40(08):1657-1662
- 2 Weitbrecht WU, Schäfer W, Walter A. Is physiotherapy useful following surgery for carpal tunnel syndrome? *Z Orthop Ihre Grenzgeb* 1995;133(05):429-431
- 3 Cebesoy O, Kose KC, Kuru I, Altinel L, Gul R, Demirtas M. Use of a splint following open carpal tunnel release: a comparative study. *Adv Ther* 2007;24(03):478-484
- 4 Mariano ER, Lehr MK, Loland VJ, Bishop ML. Choice of locoregional anesthetic technique affects operating room efficiency for carpal tunnel release. *J Anesth* 2013;27(04):611-614
- 5 Sørensen AM, Dalsgaard J, Hansen TB. Local anaesthesia versus intravenous regional anaesthesia in endoscopic carpal tunnel release: a randomized controlled trial. *J Hand Surg Eur Vol* 2013;38(05):481-484
- 6 Munns JJ, Awan HM. Trends in carpal tunnel surgery: an online survey of members of the American Society for Surgery of the Hand. *J Hand Surg Am* 2015;40(04):767-771.e2
- 7 Bismil M, Bismil Q, Harding D, Harris P, Lamyman E, Sansby L. Transition to total one-stop wide-awake hand surgery service-audit: a retrospective review. *JRSM Short Rep* 2012;3(04):23. Doi: 10.1258/shorts.2012.012019
- 8 Chatterjee A, McCarthy JE, Montagne SA, Leong K, Kerrigan CL. A cost, profit, and efficiency analysis of performing carpal tunnel surgery in the operating room versus the clinic setting in the United States. *Ann Plast Surg* 2011;66(03):245-248

- 9 Leblanc MR, Lalonde J, Lalonde DH. A detailed cost and efficiency analysis of performing carpal tunnel surgery in the main operating room versus the ambulatory setting in Canada. *Hand (NY)* 2007;2(04):173-178
- 10 Davison PG, Cobb T, Lalonde DH. The patient's perspective on carpal tunnel surgery related to the type of anesthesia: a prospective cohort study. *Hand (NY)* 2013;8(01):47-53
- 11 Lalonde D, Martin A. Tumescent local anesthesia for hand surgery: improved results, cost effectiveness, and wide-awake patient satisfaction. *Arch Plast Surg* 2014;41(04):312-316
- 12 Rozanski M, Neuhaus V, Reddy R, Jupiter JB, Rathmell JP, Ring DC. An open-label comparison of local anesthesia with or without sedation for minor hand surgery. *Hand (NY)* 2014;9(04):399-405