

**RESEARCH ARTICLE**

# WALANT Technique versus Local Anesthesia with a Tourniquet in Carpal Tunnel Syndrome

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## Abstract

**Objectives:** Obtaining a blood-free surgical field is critical during carpal tunnel decompression (CTD) to identify anatomic structures and avoid iatrogenic injury. A tourniquet is often used to minimize bleeding and improve visualization. However, it may be associated with discomfort and intolerance when sedation is not employed. WALANT ("Wide awake local anesthesia no tourniquet") technique surgeries have become very popular and enable the patient to be involved in the procedure; in addition, the adrenaline avoids the use of the tourniquet and the discomfort it produces. We hypothesized that there is no difference in postoperative pain after CTD between local anesthetic with a tourniquet (LA-T) and WALANT technique. The objective of this paper is to report the results of CTD, comparing those performed with local anesthesia and those performed with the WALANT.

**Methods:** In this prospective study, 60 CTS were operated in two different institutions. Patients in group 1 (30 patients) were operated under LA-T, while patients in group 2 (30 patients) were operated on using lidocaine with epinephrine (WALANT). Statistical analysis was performed.

**Results:** Postoperative pain immediately after surgery, at 4 and 24 hours, and 15, and 30 days after surgery; and degree of satisfaction did not show a significant difference between the two groups. Moreover, surgical time was slightly shorter in the LA-T group, but the difference was not significant.

**Conclusion:** In our study, CTD performed with LA-T, and WALANT technique resulted in similar results. In cases of experienced surgeons, LA-T may be enough to perform the procedure, avoiding epinephrine's low but complex complications. In less experienced surgeons who require more surgical time, the use of WALANT may increase the intraoperative comfort of the patient.

**Level of evidence:** IV

**Keywords:** Carpal tunnel syndrome, Epinephrine, Local anesthesia, Tourniquet, Walnut

## Introduction

Carpal tunnel syndrome (CTS) is one of the most common conditions in hand surgery. Obtaining a blood-free surgical field is critical during carpal tunnel release to adequately identify anatomic structures and avoid iatrogenic injury. A tourniquet or pneumatic sleeve is often used to minimize bleeding and improve visualization of the surgical field. However, the tourniquet

may be associated with pain, discomfort, and intolerance when sedation, a block, or general anesthesia is not employed.<sup>1-3</sup>

Hutchinson<sup>4</sup> and Maury<sup>5</sup> reported a volunteer study with good tolerance to the tourniquet of 13 and 25 minutes, respectively. Some surgeons advocate tourniquet-free procedures, suggesting that a similar bloodless surgical

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field can be achieved with the injection of xylocaine with epinephrine.

Even though data from several retrospective studies confirm the relative safety of not employing a tourniquet,<sup>6,7</sup> 57% of Canadian surgeons and up to 95% of U.S. surgeons continue utilizing a tourniquet for these minor procedures and associating them in many cases with sedation.<sup>8,9</sup>

WALANT ("Wide awake local anesthesia no tourniquet") technique surgeries have become very popular today. Among the main advantages of this technique over conventional anesthesia is that it enables the patient to be actively involved in the surgical procedure; in addition, the adrenaline avoids using the tourniquet and the discomfort it produces. Although significant economic benefits have been reported in favor of WALANT compared to surgeries with sedation anesthesia,<sup>10,11</sup> the real patient satisfaction and functional results between both procedures have not been reported in the literature.

Our hypothesis is that carpal tunnel decompression (CTD) with local anesthesia and pneumatic tourniquet, performed by an experienced surgeon involving a relatively short surgical time, allows us to obtain similar results to surgeries with the WALANT technique. The objective of this paper is to report the results of CTD, comparing those performed with local anesthesia with a tourniquet and those performed with the WALANT technique.

## Materials and Methods

We report a prospective cohort study of patients who underwent carpal tunnel release performed by a single surgeon who is a fellowship-trained orthopedic hand surgeon with more than 30 years of practice and a level IV of expertise in this procedure. From January of 2020 to July of 2021, 60 CTS were operated in two different institutions: a tertiary-care and a secondary-care hospital. All patients were enrolled from a single surgeon practice working in both institutes.

Patients in group one (G1) were operated on under local anesthesia associated with a tourniquet for hemostasis, while patients in group two (G2) were operated on using lidocaine with epinephrine (WALANT). A non-randomized consecutive sampling assigned to each group was performed based on convenience and following regulations of one of the institutions participating in this study, which forbade the use of pre-procedure epinephrine injections. Hence, all patients operated on at the secondary-care institution during this period were performed under LA-T and assigned to G1. All patients operated at the tertiary-care institution were operated with WALANT and assigned to the G2. Each anesthesia type used in each institution was part of the regular practice.

Patients in G1 were operated under local anesthesia using 20 ml of 1% lidocaine buffered with 8.4% sodium bicarbonate associated with a tourniquet for hemostasis (LA-T) after blood expression with an elastic bandage and a tourniquet insufflated at 220 mm Hg. Patients in group G2 were operated on using 20 ml of 1% lidocaine with 1:100 000 epinephrine (buffered with 10 ml lidocaine/epinephrine: 1 ml of 8.4% sodium bicarbonate). All injections were given at room temperature using a 25-gauge needle.

Patients were diagnosed with CTS based on a combination of symptoms, signs, and electro diagnostic testing. For each patient, the diagnosis was established based on the overall clinical impression of the main author (night pain, paresthesia in three first fingers, and Tinel, Phalen and Durkan positive signs) and the confirmation by electromyogram. Patients underwent operative intervention after two months failing of nonsurgical management (nighttime wrist splinting in the neutral position and nonsteroidal anti-inflammatory drugs).

Subjective preoperative assessment was performed using a Visual Analog Scale (VAS) from 0 to 10 (0 = complete absence of pain; 10 = greatest possible pain) and a Quick DASH score (Disabilities of the Arm, Shoulder and Hand).<sup>12</sup> A time-lapse of 30 minutes between the time of injection and the time of incision was left in both groups. Surgical time was clocked from the start of the incision until wound closure. Surgery consisted of CTD by releasing the carpal annular ligament. No associated nerve procedures were performed. A minimal approach (3 cm) was performed in all cases. No drainages were used. The skin closure was carried out with a 4-0 nylon and a postoperative dressing was used. In the (LA-T) group we did not open the tourniquet before the closure. We did not use electrocautery in any group.

We encouraged the patient to move their fingers quickly and to use their hands for everyday activities. At the recovery room, an assessment of pain at the time of administration of anesthesia, and satisfaction with the procedure, using a VAS was performed. Specifically, in Group two, the pain of the pressure exercised by the pneumatic tourniquet on the arm was also evaluated. A member of our team, not involved in the surgical procedure, performed all these preoperative and immediate postoperative evaluations.

Patients were instructed to evaluate pain at 6 and 24 hours after the procedure. At four days, an assessment of satisfaction with the procedure was made using a VAS. A new pain evaluation was performed at 15 days and one month after the procedure. The functional outcome was assessed with the DASH score in this final evaluation. No patient was lost to follow-up.

## Statistical analysis

Descriptive statistics include a median and interquartile range for continuous data and numbers and percentages for categorical data. The Wilcoxon test was used to compare nonparametric continuous variables and the Fisher test to compare categorical variables. The significance level was less than 5%, and all analyses were performed with the software R version 2021.09.0.

This manuscript adheres to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines; the study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki.

Based on a priori power analysis, we determined 23 patients in each group to be a sufficient sample size. We aimed to detect a two-point minimum difference on the zero- to ten-point numeric rating scale for the primary outcome (immediate POP satisfaction) using two-sided t test with a power of 90% and a 5% level of significance. This was

calculated assuming a SD of the difference of less than two-points. All analyses were performed with the software R version 2021.09.0.

## Results

Thirty CTS were operated in each institution. Thirty-five patients were female and 25 males. The mean age was 64 years (45 to 79) in G1 and 55 years in G2 (42 to 87). In 15 patients, CTD was performed bilaterally. Both groups were compared in terms of sex, affected side, dominance, pain, and preoperative functional scales [Table 1]. The average pain with the injection was 3, 9 in the G1 and 3 in the G2. In G1, the mean rage tourniquet pain was 2.3. The mean surgical time was 2, 36 m. in G1 and 3, 09 m. in G2.

**Table 1. demographic data. Y: years, M: male, F: female**

	G1: n =30	G2: n =30	Total	P-Value
Age (y)	64.1 ± 13.45	55.17 ±17.83	59.55±16.32	.046
Sex (M/F)	16/14	9/21	35/25	.115
Dominant hand (R/L)	28/2	27/3	55/5	.671
Treated hand (R/L)	17/13	22/8	39/21	.170

Immediate satisfaction with the procedure was 9.2 in G1 and 9.3 in G2. Pain at 6 and 24 h was 4.1 and 2.7 in G1 and 4.9 and 3.1 in G2, respectively. At four days, the satisfaction was 8.1 in G1 and 8.6 in G2. At 15 and 30 days, the pain was 0.7 and 1.5 in G1, and 0.8 and 1.5 in G2, respectively. The DASH score was 23.9 in G1 and 18.3 in G2.

**Table 2: Table of results. G1: group 1, G2: group 2; Hs: hours, VAS: visual analog scale; POP: postoperative**

	G1	G2	P-Value
Preoperative pain	7.4±2.05	7.2±2.06	.662
Preoperative DASH	47.9±18.23	33.6±14.14	< 0.001
Injection pain	3.98±1.98	3±2.1	.084
Surgical time (min± sec)	2:36±57	3:09±53	.082
Tourniquet pain	2.37±1.81		
Immediate POP Satisfaction	9.27±0.88	9.3±0.88	.717
6 hs POP pain (VAS)	4.1±1.54	4.93±1.72	.050
24 hs POP pain (VAS)	2.73±1.84	3.1±1.47	.198
4 days POP Satisfaction (VAS)	8.13±1.14	8.6±0.77	.120
15 days POP pain (VAS)	1.57±1.33	1.5±0.78	.869
30 days POP pain (VAS)	0.72±0.7	0.8±0.76	.764
Postoperative DASH	23.93±11.34	18.03±9.39	.042

Regarding the relationship between the two groups, the functional results of pain and degree of postoperative

satisfaction did not show differences with statistical significance [Table 2]. No infection complications were evidenced. One patient of G1 operated bilaterally presented in the immediate postoperative period with mild hypotension, which recovered in the hour after the procedure.

## Discussion

The main objective of this study was to compare the postoperative results of a group of patients undergoing CTD with and without the use of tourniquets. Despite the long-standing use of lidocaine infiltration with epinephrine, surgeries with WALANT techniques have significantly developed in recent years.<sup>6</sup> In selected patients, avoiding sedation can be very useful from several aspects, including economic and the opportunity to involve the patient, encouraging the patient-doctor relationship directly.<sup>7</sup>

Therefore, performing CTD with local anesthesia is a good treatment option. Concerning using local anesthesia with tourniquet versus WALANT technique, some studies have documented the latter's advantages. In a prospective randomized study, Saleh et al.<sup>13</sup> reported that in CTD and trigger finger surgeries, better results in intraoperative comfort in patients in which tourniquet was not used. In a systematic review, similar results were reported by Olaiya et al.<sup>14</sup>; they concluded that patients operating with WALANT presented less perioperative discomfort due to the non-use of the tourniquet. However, the overall patient satisfaction was similar in both groups.

There are some publications on tourniquet tolerance time, and according to them, times exceeding 17 minutes are associated with pain and intolerance to the tourniquet.<sup>15</sup> In our series, the immediate satisfaction with the procedure was high and similar (9.4 and 9.6, respectively) between the two groups. When we specifically evaluated tourniquet tolerance, we obtained relatively low pain, with a mean of 2/10.

Gunasagaran J et al.<sup>16</sup> also reported better intraoperative comfort in patients operated without a tourniquet. Although carpal tunnels, trigger fingers, and ganglions were included in that study, the operative times were 16 minutes in the group with a tourniquet and 17 minutes in the group with WALANT. These times are, in our understanding, at the limits of cuff tolerance. Therefore it is reasonable that, in their publication, they report more intolerance and more surgical discomfort in those patients operated with local anesthesia and tourniquet. The authors do not clarify what level of expertise the surgeons had, but we consider this essential to reduce surgical times and improve tolerance to the tourniquet. Although the complication rate with the use of epinephrine is rare, some cases of digital ischemia after epinephrine injection have been reported.

Zhang et al.<sup>17</sup> reported a case of fingertip gangrene that resulted in amputation after the release of 3 trigger fingers. Zhu et al.<sup>18</sup> reported a carpal tunnel syndrome and trigger finger case that developed prolonged ischemia that could be successfully controlled with the administration of phentolamine to reverse the vasoconstriction effect at 14 hours. Later, the patient was revealed to have cold intolerance. Therefore, the WALANT technique should be

avoided in patients with any vascular insufficiency.

Despite these potential complications, we consider the WALANT technique extremely useful in some procedures such as tendon repair or tendon transfers where a longer operative time is required. It provides us with the benefits of assessing intraoperative mobility.<sup>15</sup>

Our study has certain advantages, such as being two groups with similar demographic characteristics, that preoperative evaluations were performed by an author not involved in the follow-up, and that all completed their evaluation without loss to follow-up. However, it also has some limitations, such as not having a large group of patients, not being randomized, and the interventional surgeon performing all postoperative assessments.

### Conclusion

In our study, CTD performed with LA-T, and WALANT technique resulted in similar results. In cases of experienced surgeons, LA-T may be enough to perform the procedure, avoiding epinephrine's low but complex complications. In less experienced surgeons who require more surgical time, the use of WALANT may increase the intraoperative comfort of the patient.

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