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What Is the Infection Rate of Carpal Tunnel Syndrome and Trigger Finger Release Performed Under Wide-Awake Anesthesia?

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Abstract

Background: High infection rates have been reported in hand procedures using the wide-awake local anesthesia no tourniquet (WALANT) method, causing some to question the validity of this approach. However, little evidence exists surrounding the direct use of WALANT compared with monitored anesthetic care (MAC). This study was conducted to directly compare the postoperative infection rates of carpal tunnel syndrome (CTS) and trigger finger (TF) release surgeries performed under WALANT and MAC. **Methods:** A retrospective study comparing postoperative infection rates between patients undergoing CTS and TR releases was conducted. Our primary outcome measure was postoperative infection. Our secondary outcome was postoperative complications. Comparative statistics were used to compare means of infection between the groups. **Results:** A total of 526 patients underwent CTS release (255 with WALANT and 271 with MAC), and 129 patients underwent TF release (64 with WALANT and 65 with MAC). Patients undergoing WALANT and MAC were statistically comparable in terms of sex, smoking status, diabetes, and American Society of Anesthesiologists physical status classification. In patients undergoing CTS release, there were no infections with WALANT and 6 infections (2.2%) with MAC. In patients undergoing TF release, there were no infections in either group. There were similar rates of complications in patients undergoing WALANT and MAC for CTS and TF releases. **Conclusion:** There was no increased risk of infection with WALANT compared with MAC in CTS or TR surgeries. These surgeries can be safely conducted with lidocaine and epinephrine without a concern for increased risk of infections or complications.

Keywords: hand surgery, local anesthesia, tourniquet, wide-awake, WALANT

Introduction

Wide-awake local anesthesia no tourniquet (WALANT) surgery has gained significant popularity for minor hand procedures over the past few years. This technique uses a mixture of lidocaine and epinephrine to perform surgery in a bloodless field without the need for an anesthesiologist or a tourniquet. Although WALANT has been performed in Canada for decades, it has rapidly gained popularity around the world based on increased patient satisfaction[1] and reduced surgical costs.[2,3] Although this anesthesia technique is increasingly reported to treat fractures,[4-9] the most common indications among hand surgeons are elective routine soft tissue surgical procedures such as carpal tunnel syndrome (CTS) and trigger finger (TF) release.

Despite its purported benefits, opponents of WALANT have suggested there may be higher infection rates due to decreased postoperative blood flow to the surgical site due to the use of the vasospasmic agent epinephrine.[10] Evidence in the literature has shown that CTS and TF releases performed with monitored anesthesia care (MAC) or general anesthesia have an infection rate of 0.36% to 11%[11-18] and

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0% to 8%,[19,20] respectively. However, with the addition of epinephrine, there may be a significantly increased risk of postoperative infection. Some authors have even suggested that due to increased infection risks, epinephrine should be completely avoided in soft tissue hand procedures.[21]

This study was conducted to examine the effect of epinephrine on postoperative complications when performing CTS and TF releases. The study also sought to examine the overall rate of postoperative complications between patients undergoing WALANT and MAC anesthetic techniques.

Materials and Methods

A retrospective analysis was performed from our medical institution records comparing patients who underwent CTS or TF release with WALANT versus MAC anesthesia between 2013 and 2020. The primary outcome of the study was infection, which was defined as the presence or absence of a suture abscess or cellulitis of the hand that required antibiotic treatment at the discretion of the treating surgeon.[22] The secondary outcome of the study was the presence or absence of a postoperative complication, defined as any deviation from the expected postoperative evolution in pain or functional limitation, or the requirement of additional treatment (surgical or nonsurgical) as determined by the treating surgeon. All patients were followed for a minimum of 4 weeks postoperatively. For the purposes of this study, this time horizon was set as it is unlikely for patients to suffer infection beyond this time frame.[23-25]

Patients were subsequently grouped into those anesthetized with WALANT versus MAC. In the WALANT group, all cases were conducted with the use of 1% lidocaine with 1:100 000 epinephrine (buffered with 10 mL lidocaine/epinephrine:1 mL of 8.4% sodium bicarbonate). All patients were injected 30 minutes before surgery using the technique described by Lalonde and Martin.[26] Patients with CTS were injected with 20 mL of solution, and patients with TR were injected with 4 mL of solution. All surgeries were performed in a minor procedure operating room with full sterility (gowns, drapes, and floor washing between cases) with 1 nurse serving as a circulator in an outpatient manner; no sedation was administered in any case.

In the MAC group, all operations were conducted in a minor procedure operating room with full sterility, with 10 cm^3 of 2% lidocaine without epinephrine injected into the surgical site before skin incision. The cases were then conducted under sedation with a tourniquet inflated to 250 mm Hg. No preoperative antibiotics were administered in any case in either group. Decision on performing the procedure with WALANT or MAC depended on patient's preference, operating room availability, and the year of the surgery as we started using WALANT routinely in 2018.

Clinic and operative reports were reviewed for age, sex, body mass index (BMI), and American Society of Anesthesiologists (ASA) physical status classification score at the time of the surgery. In the TF cohort, data were gathered on previous steroid injections and its timing before surgery.

To determine the risk of infection from prior corticosteroid injection, all patients in the TF group were also assessed for preoperative steroid injection.

Expertise of the involved surgeons in the study were classified according to the classification by Tang.[27] Levels of experience are categorized as follows: *level I*, nonspecialist; *level II*, specialist—less experienced; *level III*, specialist—experienced; *level IV*, specialist—highly experienced; and *level V*, expert

The institutional review board of our institution approved this study. This manuscript adheres to the Strengthening the Reporting of Observational Studies in Epidemiology guidelines; the study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki.

Statistical Analysis

Descriptive statistics include median and interquartile range for continuous data and numbers and percentages for categorical data. For the CTS cohort, with a reported infection rate of 6%[28] and 1%[29] in 430 and 378 patients, respectively, a power of 80% and α of 0.05 for a sample size of 250 patients per group were estimated. For TF, with a reported infection rate of 9.6% in 83 patients[21] and 3%[30] in 103 patients, a power of 80% and α of 0.05 for a sample size of 53 patients per group were estimated. Univariate statistics were used to compare the risk of sustaining a postoperative infection or complications. Wilcoxon tests were used for continuous nonparametric comparison and χ^2 tests for categorical comparisons. Significance level was less than 5%.

Results

A total of 658 patients were enrolled in the study. In all, 526 patients underwent CTS release, with 255 in the WALANT group and 271 in the MAC group, and 129 patients underwent TR release with 64 in the WALANT group and 65 in the MAC group. Both groups from each cohort were statistically comparable in terms of sex, smoking status, diabetes, and ASA physical status classification (Table 1).

In patients undergoing CTS release, there were no infections in the WALANT group and 6 infections (2.2%) in the MAC group (P = .031). Also, there were 5 (2.0%) complications in the WALANT group and 6 (2.2%) complications in MAC group (P = 1.000). In patients undergoing TR, there were no infections in either group, whereas there were 5 complications (8% and 8%) in each group, respectively (P = .981; Table 2).

Table 1. Patients Demographics.

Variables	Carpal tunnel syndrome Group no. 1 (WALANT)	Carpal tunnel syndrome Group no. 2 (MAC)	*P* value	Trigger finger Group no. 1 (WALANT)	Trigger finger Group no. 2 (MAC)	*P* value
Patients	255	271		64	65	
Age (median [IQR])	66.00 [54.00-76.00]	70.00 [58.00-78.00]	.009	62.00 [52.00-70.25]	67.00 [57.00-75.00]	.126
(Female/Male)	178/77	182/79	.773	40/22	32/33	.088
Smokers, No. (%)	43 (16.9)	38 (14.0)	.435	6 (9.4)	3 (4.6)	.324
Diabetes, No. (%)	49 (19.2)	38 (14.0)	.138	4 (6.2)	8 (12.3)	.378
ASA, No. (%)			.474			.215
1	23 (9.0)	22 (8.1)		7 (10.9)	13 (20.0)	
2	200 (78.4)	205 (75.6)		51 (79.7)	43 (66.2)	
3	32 (12.5)	44 (16.2)		6 (9.4)	9 (13.8)	

Note. WALANT = wide-awake local anesthesia no tourniquet; MAC = monitored anesthetic care; IQR = interquartile range; ASA = American Society of Anesthesiologists.

Table 2. Results.

	Carpal tunnel syndrome Group no. 1 (WALANT)	Carpal tunnel syndrome Group no. 2 (MAC)	*P* value	Trigger finger Group no. 1 (WALANT)	Trigger finger Group no. 2 (MAC)	*P* value
Infections (%)	0 (0.0)	6 (2.2)	.031	0	0	
Complications	Wound dehiscence (4) Wound adherence (1)	Wound dehiscence (5) Wound adherence (1)	1.000	Wound dehiscence (3) Wound adherence (2)	Wound dehiscence (3) Wound adherence (2)	.981

Note. WALANT = wide-awake local anesthesia no tourniquet; MAC = monitored anesthetic care.

All complications were successfully treated nonoperatively with local wound care or physical therapy. Sixteen patients in the MAC/TR group received 1 or more corticoid injection(s) preoperatively with an average time of 26 months before surgery (range, 3-108 months).

All surgeries were performed by 2 hand surgeons with a level of expertise of III and IV, respectively, or by a resident under their supervision.

Discussion

The main finding of this study is that the use of epinephrine in the WALANT technique does not increase the risk of infection compared with MAC. However, interpretations of our findings should be performed in the context of our limitations.

First, our study was underpowered to measure the impact of certain conditions such as smoking, diabetes, or immunosuppression, which might influence the higher infection rate in the MAC group. However, to address this limitation, data regarding ASA physical status were collected on both subgroups, which were statistically comparable. Although ASA is not a direct measure of the above-mentioned conditions, we find it a reproducible and accurate way to represent comorbidities in patients. Second, our low incidence of infection may be biased by the retrospective nature of our study and the possibility of an observer bias, as 1 surgeon was involved in patients' follow-up and data collection. Nevertheless, the infection rate in our series is similar to others reported on the same topic.[22]

A recent retrospective analysis that aimed to determine whether a recent steroid injection was associated with postoperative surgical infections on TR release explicitly recommended in their conclusions avoidance of epinephrine in the local anesthetic solution as this may minimize surgical site infection risks.[21] They postulated that the addition of epinephrine and subsequent vasoconstriction may decrease the return of blood flow to the surgical site when an intraoperative tourniquet was used and let down in hand surgery. This effect may lead to less flushing away of microbial agents from the exposed wound compared with the relative vasodilation of vessels that have been exposed to lidocaine alone.[21]

Lidocaine has demonstrated a dose-dependent growth inhibition of various strains of bacteria in a laboratory environment, whereas the addition of epinephrine to the local anesthetic did not affect susceptibility to lidocaine.[31] However, *Staphylococcus aureus*—the most common organism involved in postoperative infection[32]—has been shown to be the least sensitive bacteria of all the strains tested.[31] Another study testing the effects of lidocaine on an in vivo setting concluded that wound infiltration of 2% lidocaine was associated with a decrease in bacterial count of more than 70%. However, the addition of epinephrine was associated with a 20-fold increase in bacterial counts compared with control values, suggesting that tissue hypoxia secondary to vasoconstriction might lead to a higher chance of bacterial colonization.[10] These conclusions contrast with the in vitro findings of Parr et al[31] and the clinical results of Leblanc et al[22] and our series. Further in vivo studies are necessary to make conclusions on the effect of adding epinephrine and bacterial susceptibility to lidocaine.

A possible explanation for these different results might be our different infrastructure setting. In our study, all surgeries were performed at the same institution by a constant team led by 2 surgeons. In contrast, in the study by Kar Yee Ng et al,[21] 6 different surgeons operating in at least 3 different facility groups might have led to different operative practices of nursing, anesthesia, cleaning staff, materials, and autoclaving.

Although the current literature suggests that patients with obesity are more likely than people with normal BMI to develop postoperative infections,[33] in the series by Kar Yee Ng et al,[21] BMI was not significantly correlated with infection rates (average BMI, 30.0 kg/m^2 [range, 18.5-46.6 kg/m^2]). In addition, BMI cannot explain their different results from our conclusions as their cohort is not comparable to ours (average BMI, 30.2 kg/m^2 [range, 17.1-60.6 kg/m^2]).

The sterility type needed to perform open CTS release has recently been questioned. Leblanc et al[22] in a multicenter prospective study concluded that CTS release using field sterility had a superficial infection rate of 0.4% and a deep infection rate of 0%. This study opened up the door for us to switch our practice from traditional full sterility to field sterility with the added benefits of decreasing medical costs and surgical waste while maintaining patient safety and satisfaction.

Conclusions

This is a retrospective study; hence, concluding that WALANT is safer than MAC would be inaccurate. Nevertheless, we are able to conclude that performing CTS and TF release with WALANT technique does not increase the incidence of postoperative infections compared with MAC. In addition to this, we are able to conclude that noninfection complications in both groups have a similar incidence performed with either technique. Furthermore, level I studies should be performed to rule out the role of epinephrine in postoperative site infection.

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Ethical Approval

Our study was approved in advance by our institutional review board (IRB00010193).

Statement of Human and Animal Rights

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.

Statement of Informed Consent

Data were deidentified precluding informed consent of those included in the study.

Declaration of Conflicting Interests

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