

The efficacy of WALANT technique in Hand Surgery



Niraj Ranjeet¹, Pratyenta Raj Onta², Krishna Sapkota³, Pabin Thapa⁴,
Uendra Jung Thapa⁵, Krishna Wahegoankar⁶,

^{1,3,6}Associate Professor, ^{2,4,5}Assistant Professor, Department of Orthopedics, Manipal Teaching Hospital (MTH), Pokhara, Nepal

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ABSTRACT

Background: Nowadays, Wide Awake Local Anesthesia No Tourniquet (WALANT) technique has gained popularity among surgeons because of its use in variety of surgical procedures because it provides excellent hemostasis, eliminating the need of tourniquet, sedation and the risk and cost of general anesthesia. **Aims and Objective:** In this study, we wanted to evaluate its efficacy and the experiences of the patients and surgeons in different hand surgeries. **Materials and Methods:** We had 108 patients who underwent various hand surgeries under WALANT technique. Patients and surgeons were requested to fill a questionnaire after the procedure. The procedure was evaluated in terms of the pain compared to a dental procedure, duration of the anesthesia, amount of bleeding and patients' satisfaction. **Results:** The mean age of our patients was 42.7 years. A variety of hand surgery was performed in our study. The mean local anaesthetic volume used was 16.5 ml. The Tang grading system was used to evaluate the levels of surgeon's experience; 75% of surgeons were a Level 2, 18% Level 3 and 7% Level 4. Sixty-four patients experienced WALANT to be less than, 30 patients equivalent to and 8 had more pain compared to a dental procedure. There was a significant correlation between volume of local anesthetic used, duration of surgery and number of procedural components repaired. Both pain and anxiety levels were significantly less intra-operatively and postoperatively as compared to the level at the time of injection. Eighty-seven patients considered it to be better than expected, and would prefer it in the future in case they have to undergo surgery. **Conclusion:** We observed that our patients were satisfied with their experience on WALANT technique and the surgical procedures, and we recommend the use of this for a variety of hand surgery procedures.

Key words: Efficacy; Hand Surgery; Wide Awake Local Anesthesia No Tourniquet (WALANT)

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INTRODUCTION

Epinephrine is a nonselective adrenergic agonist. When injected locally, they cause vasoconstriction in the skin and subcutaneous tissue providing hemostasis and prolonged anesthetic duration. Because of this vasoconstrictive property they are used to decrease intraoperative bleeding in many areas of the body. Despite of several scientific evidence that using low dose adrenaline (1:100,000) in the fingers is safe,¹⁻⁴ still many doctors and health workers fear the use of adrenaline in surgery of the fingers and

hand. This concern is mostly based on papers written between 1920 and 1940, when procaine with and without epinephrine was used, which resulted in finger necrosis. Around 48 cases of finger necrosis that occurred before 1950, were attributable to procaine local anesthesia. Procaine is quite acidic, with a pH of 3.6, and the pH can go as low as 1 with prolonged storage in the body. This acidity, is likely responsible for the historical reports of finger necrosis and not the addition of epinephrine. Despite the lack of valid evidence, it is still believed that epinephrine injection is contraindicated in the finger.

Address for Correspondence:

Dr. Niraj Ranjeet, Associate Professor, Department of Orthopedics, Manipal Teaching Hospital, Pokhara, Nepal.

Mobile: +977-9856015762. **E-mail:** ranjitniraj@yahoo.com

Lidocaine, has been used safely both with and without epinephrine between 1880 to 2000, and without any documented cases of digital tissue loss or necrosis.^{1,5} Various recent studies have shown that epinephrine can be safely injected in the finger and hand. Adding epinephrine to lidocaine provides anesthesia as well as bloodless field through vasoconstriction, thus eliminating the need for a tourniquet during surgery. Because arm tourniquet is unnecessary, we can perform the surgery with patients wide-awake. This benefits the surgeon as well as the patients by enabling the surgeon to make fine adjustments to repair tendons, joints, and bones during surgery, before closing the skin.

The proposed benefits of WALANT includes:

- local anesthesia is convenient than general anesthesia
- the risks of general anesthesia are avoided, particularly in elderly patients with medical conditions
- avoiding the tourniquet with local anesthesia increases the comfort of the patients
- active range of motion of fingers can be assessed intraoperatively without pain and hurry induced by arm tourniquet in flexor tendon tenolysis and flexor tendon repair
- gapping at the repair site and catching of the tendon by cruciate pulley during active range of motion can be observed and resolved intraoperatively in zone II flexor tendon repair

Many studies have summarized the safety of lidocaine with epinephrine.⁶ Wilhelmi et al.,⁴ reported its safety in all of their 29 fingers injected with it. Chowdhry et al.,⁷ did a clinical trial in 1,111 patients where digital block anesthesia with lidocaine and epinephrine was used and reported no complications associated with it. Lalonde et al. conducted the Dalhousie project and prospectively reviewed 3,110 cases, where lidocaine with epinephrine $\leq 1:100,000$ was injected electively into fingers and hands of their patients and found no cases of digital necrosis nor needed phentolamine for reversal.⁸

Though these studies have emphasized the safety of the lidocaine with epinephrine we wanted to experience its efficacy as well as safety. We also wanted to evaluate our patients' experiences and their satisfaction with different hand surgical procedures under WALANT technique and the complications with this technique.

MATERIALS AND METHODS

There were 108 patients (64 males and 44 females) with a mean age of 42.7 (18 to 70 years) who underwent hand surgery under WALANT technique in Manipal Teaching

Hospital from 1st July 2019 till 31st December 2020. Patients less than 18 years of age or more than 75 years were excluded, to meet the guidelines of the human subject committees. Patients who did not consent to the study were also excluded (Table 1). All patients who were eligible to be included in our study were informed about the methods of anesthesia apart from the surgery he/she undergoing. Patients were informed that if the anesthesia failed then they will have to undergo general anesthesia or regional blocks. Written informed consent was obtained from each patient. Local anesthetic mixture was injected in the pre-operative room. All the surgery were conducted by different surgeons of varying levels of experience but under the supervision of the hand surgeon.

Dilution

The amount of lidocaine with epinephrine that can be safely injected in a human being is up to 35 mg per kg but we prefer to use 7 mg per kg as the upper limit. Thus, if a person weighs 70 kg, this equates to 490 mg or 49 mL of 1% lidocaine with epinephrine 1:100,000. So, when we require >50 mL, then normal saline is added. Up to 150 mL of normal saline can be added to 50 mL to make it 200 mL which will be a dilution of 0.25% lidocaine with epinephrine 1:400,000, which is effective for hemostasis as well as anesthesia.⁹ For all cases, 1% lidocaine and epinephrine 1:100,000 was mixed with 8.4% sodium bicarbonate at a rate of 1ml per 10 ml local anesthesia to buffer the acidic pH of the lignocaine. This buffering of lidocaine with sodium bicarbonate was associated with a statistically significant reduction in pain as compared to unbuffered lidocaine¹⁰ but without decreasing the efficacy and stability of the lidocaine and epinephrine.¹¹

Injection

The injection technique is very well described by Lalonde.⁹ When hemostasis is required, approximately 2 mL of anesthetic mixture is injected into the volar and dorsal subcutaneous tissues of each proximal and middle phalanx where surgery will occur. For the distal phalanges, 1 mL or less is enough. But if only a sensory block is necessary, the single subcutaneous injection in the midline of the proximal phalanx (SIMPLE) technique is sufficient. In the SIMPLE block, 2 mL of anesthetic mixture is injected into the subcutaneous fat located between both digital nerves (Figure 1). which provides digital anesthesia for an average of up to 10.4 hours, compared to those without epinephrine which only lasts an average of 4.9 hours.⁹ Patients were careful explained of the procedure. The anesthetic mixture was infiltrated using a 23-gauge needle 30 minutes prior to surgery in the pre-operative room. After 30 minutes, patients were taken to the operating

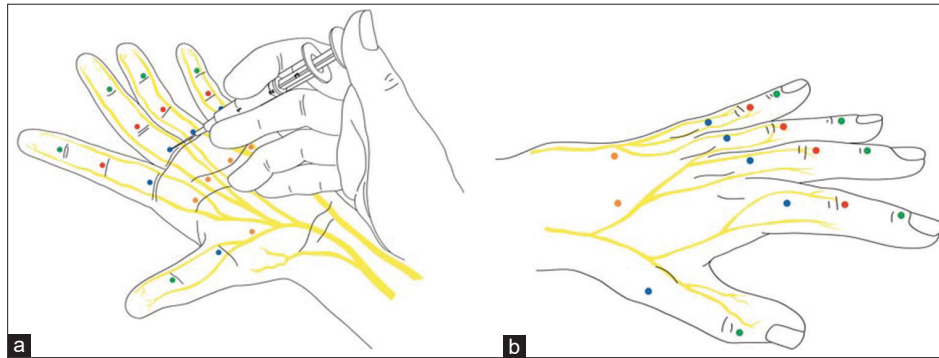


Figure 1: (a and b) Illustration of the sites of volar and dorsal injection of local anesthesia in WALANT technique

room, prepped and draped according to the surgery needed. Tourniquet was not applied in any of the cases.

Postoperatively, the patients and the surgeon were asked to complete a survey questionnaire to evaluate the efficiency of the technique (Table 2). All patients were discharged on the same day with the appropriate antibiotics and analgesics. They were followed up on 2 weeks to evaluate the surgical procedures or when needed.

The demographic data of the patients were collected and compared between the groups. The analysis of various surgical cases was done by counting the number of components repaired or reconstructed. The need for repair of a nerve, vessel, tendon, bone and skin were each counted as individual components. Pearson correlation tests were used to analyze for any statistically significant associations between the variables. Analysis of patient's pain and anxiety were compared at time of the injection, during surgery and immediately post-op using a one-way analysis of variance test.

RESULTS

A variety of hand surgery was performed in our study. The mean local anesthetic volume used was 16.5 ml (10–30 ml). Sixty-six patients required 10 - 20 ml, and 42 patients required 20 -30 ml. We had no incidence of finger ischemia. There were 72 (66.67%) patients requiring surgery involving 3 or less surgical components. The Tang grading system was used to evaluate the levels of surgeon's experience; 75% of surgeons were a Level 2, 18% Level 3 and 7% Level 4 (Table 3).¹²

Patients were requested to compare their experience of WALANT technique and surgical procedure to having a dental procedure. Sixty-four of the patients experienced WALANT to be less than, 30 patients equivalent to and 8 had more pain than a dental procedure. Six patients never had any dental procedure before.

Table 1: Suggested inclusion and exclusion recommendations for WALANT

Cases included for WALANT	<ul style="list-style-type: none"> • Carpal Tunnel Syndrome • Trigger Finger • De Quervain's Tenosynovitis • Dupuytren's Contracture • Superficial infection of fingers • Any digital injury involving nail, bone, nerve, tendon, with no vascular compromise
Cases excluded for WALANT	<ul style="list-style-type: none"> • evidence of infection at the injection site • previous history of allergy to local anesthesia • pregnancy • significant history of myocardial infarction, active coronary artery disease or finger ischemia, vasculitis, Buerger's disease, scleroderma • Patient does not wish to be awake • Anxious and non-compliant patient • Pediatric cases

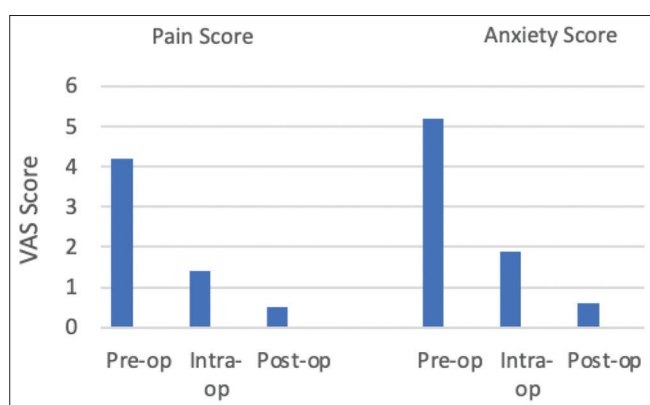
Table 2: Questionnaire for surgeons and patients after surgery with WALANT

For the surgeon	<ul style="list-style-type: none"> • amount of bleeding during the surgery • compliance of the patient • volume of anesthesia used
For the patient:	<ul style="list-style-type: none"> • anxiety before, during and immediately after the procedure • number of pricks felt • Visual Analogue Scores (VAS) measured during injection of local anesthesia, during their surgery and immediately post-surgery • duration of anesthesia • their overall experience and whether they would recommend WALANT

The VAS (Visual Analogue Scale) score (0–10) was used to determine pain and anxiety during infiltration, intra-operatively and postoperatively. The mean pain scale during infiltration was 4.2, intra-operatively 1.4 and postoperatively 0.5. The mean anxiety score was 5.2 preoperatively, 1.9 intra-operatively and 0.6 postoperatively. Both pain and anxiety levels were significantly less intra-operatively and postoperatively as compared to the level at the time of injection ($p < 0.05$) (Figure 2). The duration of anesthetic effect was < 2 hours in 28 patients, 2–4 hours in 73 patients and > 4 hours in 7 patients. Post-operatively 18 patients did

Table 3: Comparison between different surgical procedures, volume of local anesthesia used, time taken and Tang level

Procedure	n =	Mean Volume of Anesthesia (ml)	Mean time taken for surgery (min)	Mean Tang Level (1-5)
Wound debridement & skin closure	26	17.2	42	2.5
Finger-tip reconstruction	15	9.7	37	2.3
Carpal Tunnel Release	7	13.3	48	2.8
De Quervain's Release	6	7.4	26	2.1
Trigger Finger Release	10	7.6	24	2.0
Fasciectomy for Dupuytren's Contracture	4	18.9	65	4.0
Single digit FDS/FDP repair	16	16.2	45	2.9
Multiple digit FDS/FDP repair	7	22.5	78	3.9
Single digit extensor tendon repair	6	12.4	36	2.2
Phalangeal Fracture	4	11.5	57	4.0
Metacarpal Fracture	3	14.6	60	4.2

**Figure 2:** Patients' mean values for pain and anxiety scores during their WALANT procedure

not require any oral analgesics, 67 took paracetamol only, and 23 needed paracetamol and ibuprofen.

Overall, hand surgery under WALANT was a different experience for most patients. Ninety-three (86.11%) patients considered it better than expected, and reported that they would recommend it to friends and family and would prefer it in the future in case they have to undergo surgery.

DISCUSSION

With the rise in the incidence of accidents and emergencies at home, work or road, hand injuries are sometime neglected or delayed, and it requires the surgeon to operate them in minor operation theater or under local anesthesia. Many authors have gained considerable experience with WALANT and understood its limitations in acute hand trauma care and microsurgical emergencies.^{13,14} WALANT surgery has gained popularity worldwide in the last 10-12 years. There are numerous benefits with the practice of WALANT, which includes: rapid see-and-treat for patients in the absence of fasting criteria, control of turnover along with better use of list

capacity, less preoperative visit, early patient recovery, early discharge, decreased inpatient stay and cost savings compared with other studies,¹⁵ more efficient and rapid management for trauma procedures, like flexors tendon, extensor tendon and nerve injuries, small bone fractures.¹³ Most importantly, WALANT surgery allows for daycare surgery and avoids potential aerosol-generating procedures by intubation, thereby limiting patient risk and exposure to Covid-19 infection.¹⁶

In our study, most of the patients were satisfied with the use of WALANT technique for different hand surgical procedures. Most of them were more comfortable than dental procedures and found to be easier than they had expected.

Similar to other studies, most of our patients reported little or no pain during local anesthetic infiltration, during and after surgery.^{17,18} Besides, it was observed that the mean intraoperative pain score was significantly less than the mean pain score during the infiltration, which encouraged us to operate on more patients under WALANT. Surgery under WALANT technique is still sporadically used in Nepal, may be because of some fear of using epinephrine or the side effects of injecting large volumes of local anesthesia. Teo et al.,¹⁷ emphasized in their study that injections should be given in areas outside the surgical site. We agree that large volumes of local anesthesia should be injected in a wider area for tumescence within the safe dose of 7 mg/kg lidocaine, especially during bony procedures and contracture releases.^{17,19}

Similar to other studies, where the pain in WALANT technique was compared to a dental procedure, majority of our patients (87.03%) reported having better operative experience.^{18,20} This might be attributed to the fact that it is easier to leave the hand on a table during a hand surgical procedure than to keep the mouth wide-open during a dental procedure.

In our study, 86.11% of our patients were satisfied with their WALANT experience and would choose the same anesthesia technique in the future operations. Similarly, to our results, 86% of the patients in the study by Teo,¹⁷ 94% of the patients in the study by Rhee¹⁸ and 93% of the patients in the study by Davison,²⁰ would choose WALANT technique if they need to undergo hand surgery in the future.

LIMITATIONS OF THE STUDY

Our study has several limitations. First of all, it was not a comparative study. Apart from that, all patients' experiences for different surgical procedures were included as a whole, which could not reflect the patient's experience for a specific surgical procedure. It would be better if we could compare the patients' experiences for particular surgical procedure with WALANT and different anesthesia methods like regional block or general anesthesia. Another important contributing factor is that the anesthesia and surgeries were conducted by different surgeons of varying levels of experience. This biasness could be overcome if all anesthesia was given by the same surgeon or if the different surgeons would gain more experience with the WALANT technique.

CONCLUSION

The majority of our patients were satisfied with their WALANT technique and operative experience. In the near future, as more surgeons will gain more experience with the technique for variety of hand surgical procedures, we expect better result and more acceptance of this technique by the surgeon as well as the patients. We observed WALANT technique to be safe, effective, cost effective and without any added complications. We therefore recommend the WALANT technique to be used for a variety of hand surgical procedure.

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NR- Concept and design, review of literature, statistically analysis and interpretation, manuscript preparation and revision. **PRO-** Data collection and manuscript revision. **KS-** Literature search and review. **PT-** Data collection, statistical analysis and literature review. **UJT-** Literature search and review. **KW-** Manuscript revision.

Work Attributed to:

Department of Orthopedics, Manipal Teaching Hospital, Phulbari, Pokhara, Nepal.

Orcid ID:

Dr. Niraj Ranjeet- <https://orcid.org/0000-0001-5460-5839>

Dr. Pratyenta Raj Onta- <https://orcid.org/0000-0002-6013-4014>

Dr. Krishna Sapkota- <https://orcid.org/0000-0002-2277-8556>

Dr. Pabin Thapa- <https://orcid.org/0000-0003-1336-5837>

Dr. Upendra Jung Thapa- <https://orcid.org/0000-0003-1980-5610>

Dr. Krishna Wahegaonkar- <https://orcid.org/0000-0001-7274-7099>

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