

Contents lists available at [ScienceDirect](#)

Journal of Hand Surgery Global Online

journal homepage: www.JHSGO.org

Review Article

Current Evidence Involving WALANT Surgery

Katherine M. Connors, MD, * Sara M. Guerra, MD, † Steven M. Koehler, MD ‡

* SUNY Downstate Medical Center, Department of Orthopaedic Surgery, Brooklyn, NY

† Cedars Sinai, Department of Plastic Surgery, Los Angeles, CA

‡ Montefiore Medical Center, Department of Orthopaedic Surgery, Bronx, NY



ARTICLE INFO

Article history:

Received for publication October 21, 2021

Accepted in revised form January 20, 2022

Available online March 1, 2022

Key words:

WALEvidence

Field sterility

Lidocaine with epinephrine

Local anesthesia

WALANT

Wide-awakeANT

Wide-awake local anesthesia no-tourniquet (WALANT) surgery is an attractive option for hand surgeons, particularly during resource-scarce periods, as it eliminates dependence on main operating rooms or hospital-based procedures. The limited prepping or draping used for WALANT field sterility is as effective, if not more effective, than standard sterile prepping or draping. Patient anxiety surrounding WALANT surgery is similar to or less than that of general or local anesthesia with or without tourniquet. Patients use the same or lower amounts of postoperative narcotics after WALANT as compared to after the other anesthetic methods. Wide-awake local anesthesia no-tourniquet surgery saves significant costs for the same surgeries when performed under general or local anesthesia with or without tourniquet. There are very few complications associated with the WALANT method of anesthesia; rare case reports include vasovagal syncope and cardiac arrhythmia due to inadvertent intravascular injection of epinephrine.

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Wide-awake local anesthesia no-tourniquet (WALANT) surgery offers an excellent alternative to local anesthesia with tourniquet (LAWT), with or without sedation, or general anesthesia (GA) to perform an array of hand procedures. Initially performed for hand-based, soft tissue procedures such as carpal tunnel or trigger finger releases, recent literature has shown that WALANT may be used for osseous procedures, such as open reduction internal fixation (ORIF) of distal radius fractures or carpal or metacarpal arthroplasty, as well as more extensive soft tissue procedures, such as spaghetti wrist reconstruction.^{1–5}

Wide-awake local anesthesia no-tourniquet has gained popularity over the past 20 years, as the epinephrine myth was clearly debunked in a landmark paper by Denkler⁶ that reviewed the history of epinephrine and its use in local anesthesia. For nearly a century, it was common teaching that epinephrine should not be used in the “fingers, nose, penis, and toes.”⁷ This saying was based upon studies from the early 20th century that demonstrated that

procaine mixed with epinephrine resulted in digital necrosis.^{8–11} In 1948, De Rougemont and Carcassoone¹² noticed that digital necrosis could occur without the use of epinephrine in digital blocks; additionally, they reported 1,500 cases of digital blocks with epinephrine, without digital necrosis. Following De Rougemont and Carcassoone's¹² article, a multitude of subsequent articles also found that the use of epinephrine in local anesthetics could be performed safely, without the development of digital necrosis.^{13–18} The use of hot soaks after surgery, a prolonged tourniquet time, and expired anesthetics were some of the confounding factors associated with digital necrosis in the presence of epinephrine. Yet, with the epinephrine myth debunked, using lidocaine and epinephrine in the hand allowed for several procedures to be performed without general sedation, regional block, or tourniquet due to the presence of a local vasoconstrictor.

Despite the safety of local anesthetic combined with epinephrine being proven in the literature, widespread adoption of WALANT procedures has been slow due to multiple areas of resistance. Many of the procedures that may be performed under WALANT have been traditionally performed in a formal operating room in a hospital setting with GA or LAWT. As such, there is concern that the anesthesiologists and perioperative nursing staff will feel “cut out” from these surgeries, reducing the need for such providers. Additionally, since WALANT cases may be performed in

Declaration of interests: No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Corresponding author: Steven M. Koehler, MD, Department of Orthopaedic Surgery, Montefiore Medical Center, 1250 Waters Place, Tower 1, 11th Floor, Bronx, NY, 10461.

E-mail address: steven.koehler@gmail.com (S.M. Koehler).

<https://doi.org/10.1016/j.jhsg.2022.01.009>

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an office-based setting rather than a hospital operating room or surgery center, there is concern about the impact on payment models. Furthermore, patient-specific factors have been brought into question, including their comfort with being awake for these procedures, their intraoperative and postoperative pain control, and postoperative functional outcomes.

This review article aims to address the current evidence supporting WALANT surgery, discussing safe sterility practices, reductions in patient anxiety, excellent postoperative pain control, and cost savings. Additionally, we will review the contraindications to WALANT, and discuss the benefits of performing WALANT surgery during the time of coronavirus disease 2019 (COVID-19).

Sterility

The standard upper extremity draping traditionally performed in a hospital or surgery center operating room has been shown to be unnecessary for WALANT procedures, according to recent literature. Leblanc et al¹⁹ prospectively studied 1,504 consecutive carpal tunnel releases performed using WALANT over the course of 2 years across multiple centers. All cases used field sterility, as defined by preparing the hand with iodine or chlorhexidine, a single drape, and a sterile tray with limited instrumentation. Surgeons were not gowned, and no prophylactic antibiotics were administered. Sterile gloves and masks were worn. Among these cases, only 6 superficial infections (0.4%) and no deep infections were reported. None of the infections that occurred required further intervention other than oral antibiotics. These impressive results were supported by subsequent studies that involved more complex procedures performed using WALANT, including ORIF of distal radius fractures, repair of spaghetti wrist, and nerve reconstructions.^{2–5} In a study by Avoricani et al,²⁰ amongst 265 WALANT cases under field sterility (including 16 distal radius ORIF cases), there was a 0% rate of infections at 14 days after surgery and a 0.37% rate of infection at 30 days after surgery. This 1 case occurred in a delayed flexor tendon repair.

These studies support the use of field sterility in WALANT surgery, as it is not associated with increased rates of infection when compared to standard sterile draping. This contributes to lower costs, reduces the need for storing bulky sterile draping packaging, and allows for allocation of such equipment to other procedures that require it. Additionally, it facilitates the ease of performing such operations outside of the traditional operation room setting.

Patient Anxiety or Comfort

As hand surgery has typically been performed using GA or LAWY with sedation, the possibility of increased patient anxiety while awake for a procedure has been a source of trepidation for many surgeons. While this concern is valid among certain populations, such as those with mental health diagnoses, the literature has shown that in general, patient anxiety in WALANT cases is the same or lower than that in GA or LAWY cases with or without sedation. In a prospective cohort study by Davison et al,²¹ 100 consecutive carpal tunnel releases performed using the WALANT technique versus 100 consecutive carpal tunnel releases performed using LAWY with sedation were compared. Amongst these patients, preoperative anxiety levels were significantly lower among WALANT patients than among sedated patients ($P = .007$). Furthermore, 93% of WALANT-treated patients reported that they would choose WALANT again, compared to 93% of patients who received sedation.

Similarly, Gunasagan et al²² demonstrated that patients treated with WALANT had better perceived patient comfort scores (using visual analog scores) than those treated with LAWY without

sedation. These results were further supported by Saleh et al's²³ 2021 randomized control trial comparing patient discomfort in wide-awake carpal tunnel surgeries with or without tourniquet; patient discomfort was significantly higher in those treated with tourniquet than without. Additionally, there was no difference in patient anxiety before and immediately after surgery between groups. The 2021 study by Abd Hamid et al²⁴ further supports this concept; in their randomized controlled study, 33 patients underwent WALANT and 32 patients underwent GA for ORIF of distal radius fractures. Between these 2 groups, there was no statistically significant difference in either the preoperative anxiety level or intra- and postoperative visual analog scores.

Such literature is in opposition to the perception that WALANT surgeries cause increased patient anxiety and discomfort. This may be due to the removal of fears surrounding intubation in GA or loss of consciousness or unawareness in the setting of sedation. Additionally, the discomfort inflicted by a tourniquet is eliminated in WALANT, further reducing a source of intraoperative discomfort and anxiety. Finally, there is possibly an element of demystifying the surgery and encouraging greater patient engagement in their care.²⁵

Pain Control

Postoperative pain is equivalent or better controlled with WALANT surgery than with GA or LAWY with or without sedation.^{25–29} Chapman et al²⁶ prospectively evaluated postoperative opioid usage in patients who underwent carpal tunnel release under WALANT versus under LAWY with sedation. They found that there was no statistically significant difference in opioid usage between patients who underwent WALANT surgery (78 cases; 4.9 pills/case) versus LAWY with sedation (198 cases; 3.9 pills/case). Kang et al²⁷ also examined opioid usage among patients who underwent WALANT versus GA versus LAWY. In this retrospective review, 20 patients underwent cubital tunnel release under WALANT versus 22 under GA protocols. Additionally, 20 patients underwent carpal tunnel release under WALANT versus 22 under LAWY and 20 under GA. Postoperative pain was statistically lower in the WALANT group in both open cubital tunnel and carpal tunnel surgeries as compared to the other methods of anesthesia, as represented by reduced postoperative opioid usage. Dar et al²⁵ further demonstrated the reduced lack of need for postoperative opioid usage in WALANT cases in their prospective cohort study, which found that only 2 of 94 patients (2.1%) sought out opioids from outside providers after undergoing WALANT cases, versus 20% of patients who underwent the same procedures under LAWY with sedation. In addition, WALANT patients had significant less pain than LAWY patients with sedation, with or without the use of opioids ($P < .0001$).²⁵

Cost

As WALANT procedures eliminate the need for preoperative testing, operating room staff, abundant draping, and the infrastructure of main operating rooms, there is typically a significant reduction in cost when performing WALANT over GA or LAWY with or without sedation.^{30–32} In an analysis of the 100 procedures performed under WALANT at a military hospital, Rhee et al³⁰ demonstrated that these cases saved the military health system \$393,100 when compared to the alternative anesthetic methods. Similarly, Tahir et al³ observed lower mean hospital costs, with costs of \$428.50 per patient who underwent hand procedures using WALANT, as compared to \$630.33 or \$734.00 when GA or a Bier block, respectively, were used.³¹ Interestingly, Maliha et al³¹ broke down the cost per minute for all personnel services required for

hand cases in the main hospital operating room versus in a procedure room; they found that the costs in the main operating room where GA or LAWY with sedation were performed were \$44 more expensive per minute than those in the procedure room where WALANT was performed. Furthermore, Maliha et al³¹ demonstrated that the cost of a single trigger finger release performed in a main operating room was \$3,344.46 more expensive than the same exact procedure in a procedure room with WALANT surgery.

Complications

While WALANT surgery has been shown to be less expensive than GA or LAWY, the rates and types of complications in WALANT must also be considered. In Tahir et al's³ 2020 study comparing ORIF of distal radius fractures performed under WALANT, general anesthesia, or Bier blocks, there were 2 complications in the GA group (attrition injury and mild local wound inflammation) and 3 complications in the Bier block group (tourniquet palsy and local anesthetic systemic toxicity). No complications were reported in the WALANT group. Similarly, in Maliha et al's³¹ retrospective review analyzing 76 trigger finger releases (39 under WALANT and 37 under LAWY with sedation or GA), there were no differences in intraoperative or postoperative complications between the 2 groups; both demonstrated similar rates of postoperative paresthesia (2.7% vs 2.7%), infection (0%), and recurrent triggering (5.13% vs 2.7%; $P = .572$).³¹ In a study by Reynolds et al,³³ 424 patients who underwent WALANT hand surgery (trigger finger releases, first dorsal compartment releases, extensor tendon repairs, mass excisions, and carpal tunnel releases) were retrospectively reviewed, examining rates of complications after surgery. Amongst all procedures, the overall complication rate was 2.8%, and included 6 superficial infections treated with oral antibiotics, 2 deep infections requiring surgical incision and drainage, and 4 recurrences requiring reoperation. None of these complications were attributed to the use of WALANT or the use of local anesthesia with epinephrine.

Complications specific to the WALANT anesthetic method are rare or have not been frequently reported, but include vasovagal syncope secondary to a patient becoming faint during the injection and "adrenaline rush" after epinephrine injection.^{34,35} This contrasts with the nausea and vomiting that may be experienced with GA, as well as the previously mentioned tourniquet-associated complications, such as postoperative nerve palsies, seen in LAWY. In a recent study of 265 WALANT procedures with up to 22 mg/kg of lidocaine with 1:100,000 epinephrine being administered, there were no instances of local anesthetic systemic toxicity.³⁶ Finally, a handful of studies reported digital ischemia; however, there was no finger loss in the setting of phentolamine reversal.^{37,38}

Patient Satisfaction

Multiple studies have shown that patients would choose WALANT again over GA or LAWY.^{28,30,39} Ayhan and Akaslan³⁹ compared WALANT versus LAWY in 24 patients who had bilateral carpal tunnel releases: WALANT was used for 1 hand, and LAWY was used for the other. In total, 91.6% of patients reported that WALANT was an easier procedure than expected, as compared to 50% with LAWY. Furthermore, 83.3% of patient preferred WALANT over local anesthesia, and 91.6% found WALANT to be easier than a dental procedure. Similarly, Rhee et al's³⁰ study at the military hospital investigating WALANT among patients undergoing carpal tunnel release showed that 94% of patients would choose WALANT again.

Contraindications to WALANT

There are few absolute and several relative contraindications to WALANT procedures. Those with an allergy to lidocaine should not undergo WALANT procedures. It is important to note whether the patient has an actual allergy to amide local anesthetics, as such allergies are exceptionally rare.⁴⁰ Additional circumstances in which WALANT should be avoided include anxious or noncooperative patients, those with an active infection, those with a needle phobia, and those with abnormal clotting profiles or bleeding disorders.³ Patients with sickle cell should also avoid WALANT surgery, given that epinephrine has been shown to increase adhesion of sickled erythrocytes and may trigger a vaso-occlusive crisis.⁴¹ Lastly, it is important to note that there are patients with comorbid contraindications to WALANT: patients with compromised peripheral circulation or severe preoperative ischemia from a previous vascular injury or with diseases including scleroderma, Raynaud disease, Buerger disease, or vasculitis should be identified and possibly excluded from WALANT surgery.⁴² In our practice, we currently do not offer WALANT as an option for any of the aforementioned vascular diseases. With the knowledge that patients may not offer complete histories, we recommend phentolamine be available to reverse the effects of epinephrine.

WALANT and COVID-19

There has been an increased interest in WALANT procedures considering the COVID-19 pandemic. Turcotte et al⁴³ discussed 16 patients who safely underwent WALANT hand procedures during the height of the COVID-19 pandemic without complications. Additionally, Kurtzman et al⁴⁴ reported on 72 patients who underwent WALANT procedures during the COVID-19 pandemic in New York City, also without complications. These papers demonstrate that WALANT surgery provides a safe alternative for orthopedic hand procedures in periods of limited resources or when main operating rooms are closed and ventilatory support is reserved for those with greater needs. Additionally, WALANT avoids the aerosol generation from intubation that occurs when GA is administered, thereby reducing the risk of COVID-19 spread.⁴⁵

Wide-awake local anesthesia no-tourniquet surgery is a safe, effective, and efficient alternative to GA and LAWY with or without sedation. Patients are equally or more comfortable with WALANT as compared to the other anesthetic methods, and typically would choose WALANT for a subsequent procedure if needed. The lack of preoperative testing, dangers associated with GA, and need for an additional person to escort the patient home postoperatively make WALANT easier for the patient than the other anesthetic methods. Additionally, the complications seen in WALANT cases when compared to the same procedures performed under GA or LAWY are equivalent, if not fewer. Furthermore, the cost savings of WALANT are substantial and should be highlighted when discussing with administration whether WALANT should be adopted in one's practice. Finally, in the setting of an unpredictable global pandemic, having a tool with which to safely perform hand procedures without the use of the main operating room and ventilatory support is key.

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