Guidelines for Wide-Awake Local Anesthesia Surgery with No Tourniquet in the Office Setting Using Field Preparation Sterility

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PATIENT SAFETY

Summary: Wide-awake local anesthesia surgery with no tourniquet, or WALANT, has become popular in surgery, especially among hand surgeons. With the increasing number of surgeons performing office-based procedures, this article provides guidelines that may be used in the office setting to help transition more traditional hospital operating room–based procedures to the office setting. This article outlines the benefits of performing office-based wide-awake local anesthesia surgery with no tourniquet and provides a step-by-step guide to performing procedures that can be easily incorporated into any hand surgeon's practice successfully and safely. *(Plast. Reconstr. Surg.* 151: 267e, 2023.)

Wide-awake local anesthesia surgery with no tourniquet (WALANT) has been increasing in popularity.[1] Although hospital privileges regulate who may and may not perform surgery in the hospital operating room environment, in most states, there is little to no regulation as to what procedures a physician may perform in the office under local anesthesia. The need to perform office-based WALANT for hand trauma management has increased during the COVID-19 pandemic,[2] and a consensus on how to perform such procedures is needed.

General anesthesia carries intrinsic risks,[3] and relatively deep general anesthesia is common in clinical practice.[4] The time spent at the deepest level of anesthesia is associated with increased complications from surgery, including death, myocardial infarction, and cognitive decline.[4–6] General anesthesia carries significant risks for the frail elderly population.[7] There is an increased risk of cognitive decline in the elderly after general anesthesia and sedation alone may not reduce this risk.[8] A large-population study of patients undergoing surgery for Dupuytren disease demonstrated that serious systemic complications, such as myocardial infarction, were not observed in patients undergoing local anesthesia and were only seen in patients undergoing regional or central nervous system anesthesia.[9]

ADVANTAGES OF WALANT WITH LIMITED FIELD PREP STERILITY

Lalonde and others[10–19] have advocated WALANT for multiple hand surgical procedures for various reasons (Table 1). They suggest that many of these procedures are inappropriate for the operating theater and demonstrate enormous cost savings when offered inside the office.[20–22] Although many cases are suitable for the office setting, more sophisticated surgery may still be offered under WALANT with full sterility in the operating room.

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Table 1. Benefits and Risks of WALANT in the Office

Benefis and Risks
Safety
• Avoidance of central nervous system anesthesia, resulting in preserved cognition
• Avoidance of thromboembolism risk
• Airway competency protects against lung injury
• Accidental peripheral injury prevented when the patient maintains sensation
• No need to stop anticoagulation
• Medications and insulin can be taken as usual on the day of surgery
• The patient can drive and sign legal documents the same day
• No myocardial depression occurs
• Intraoperative patient education decreases risk of complications in all procedures
• Much safer than sedation for patients with severe medical comorbidities
Costs
• Significant reduction in the cost to payers and Centers for Medicare & Medicaid Services
• Reduced out-of-pocket expenses for many patients
• No need for recovery facilities expenses
• Reduced complications from sedation will reduce the overall cost
Efficiency and convenience
• Access to care in the surgeon's office or a hospital procedure room separate from the main operating room leads to faster treatment
• Use of surgeon's own team provides increased efficiency
• No anesthesia turnaround time
• No need for preoperative fasting
Technical advantages
• Allows for real-time active motion by the patient to test tendon repairs, release, and correct tension
• Ensures K-wires do not hinder early range of motion for finger fractures
• Permits tenolysis to be partly performed by the patient's own motion
• Permits testing of stability of fracture fixation with active movement
• Patient can tell surgeon whether the crooked finger is now straight
• Patient seeing full active movement at the end of the case will help in rehabilitation
Risks
• Fainting
• Potential cardiac ischemia in high-risk patients
• Temporary adrenaline rush can be disconcerting if the patients are not warned
• Extremely low risk of finger ischemia, reversible with phentolamine
• Local anesthesia toxicity in case of overdose

Benefits of Tourniquet Avoidance

One of the key aspects of WALANT is the avoidance of the need for a tourniquet, because tourniquet pain may make awake surgery intolerable. Furthermore, tourniquet use has been associated with adverse outcomes, such as neuropathy, muscle damage, and increased tissue edema, also known as post-tourniquet syndrome. Post-tourniquet syndrome may evolve over 1 to 6 weeks after surgery.[23]

Local Anesthesia

Local anesthetic agents are divided into esters and amides. There are no injectable forms of ester in use. The two commonly used amides for local anesthetic by hand surgeons are lidocaine, with shorter duration and swifter onset, and bupivacaine, which is slower to take effect and longer-lasting, but more cardiotoxic. Bupivacaine provides up to 8 hours of anesthesia to pain but numbness to touch and pressure lasts twice as long. It is thus considered less suitable for office use by many physicians. Bupivacaine and lidocaine undergo hepatic elimination with a small degree of direct renal excretion.[24]

Hypersensitivity to Local Anesthetic

Case reports of true anaphylaxis to lidocaine are extremely rare and it can be estimated that over 2 billion injections have been administered since its introduction in 1948.

Esters are broken down by pseudocholinesterase, leading to the production of para-amino-benzoic acid, a known stimulus for hypersensitivity reactions.

Amides have much lower hypersensitivity risk. However, they retain the extremely rare and debatable potential to produce anaphylactic reactions, usually attributable to the preservative methylparaben, which may break down to para-amino-benzoic acid. If patients are allergic to esters, a preservative-free amide local anesthetic could be used.[25]

Local Anesthetic Toxicity and Resuscitation

Body weight is commonly used to estimate the risk of systemic toxicity; plasma levels should not exceed those stated in Table 2.

When using epinephrine, more important factors to consider are the location of the injection, pregnancy status, and cardiac, renal, or hepatic dysfunction.[26] The typical safe dose of lidocaine without epinephrine is 4 mg/kg; when combined with epinephrine, this may increase to 7 mg/kg (Table 3). For every cc of 1% lidocaine, there is 10 mg of lidocaine; therefore, for a 70-kg adult, one can expect to inject ≈50 cc of 1% lidocaine with epinephrine. This is based on conservative estimates from the 1950s.[27] More recent estimates are up to 28 mg/kg.[28] We do not advise using a higher dose than 7 mg/kg when operating away from a hospital setting without monitoring (Table 3).

Lidocaine toxicity usually will present with perioral numbness, facial tingling, and a metallic taste. Late effects at higher doses include tonic-clonic seizures, followed by ventricular fibrillation and cardiac arrest. We do not encourage the use of bupivacaine in the office setting. Bupivacaine is injected with or without epinephrine at the same dose of 2 to 3 mg/kg. This is not the preferred agent for WALANT surgery because of its myocardial

Table 2. Maximum Safe Plasma Concentrations

Anesthetic	Concentration
Lidocaine	5 μg/mL
Bupivacaine	1.5 μg/mL

Table 3. Recommended Safe Doses in the Office

Anesthetic	Safe Dose
Lidocaine	4 mg/kg (7 mg/kg with epinephrine)
Bupivacaine	3 mg/kg (no increase with epinephrine)

affinity that may cause fibrillation before central nervous symptoms present. In the event of cardiac arrest or seizure, advanced cardiovascular life support protocols must be followed with prompt airway management, intravenous fluid resuscitation, and defibrillation. The use of vasopressors to support coronary perfusion may be needed. Amiodarone should be chosen over lidocaine to manage arrhythmias. Seizures should be managed with benzodiazepines.[26] Electromechanical dissociation may be rescued using lipid emulsion.[29,30]

Large-Volume Tumescent Local Anesthesia

When there is a need for larger volumes of local anesthesia, such as for the forearm, lidocaine retains effective local anesthesia when diluted. A total of 1% lidocaine can be diluted with 1:100,000 epinephrine buffered with 8.4% bicarbonate up to 200 cc with saline, although the duration of action will be reduced.[31,32]

Safety of Epinephrine in Hand Surgery

The use of epinephrine in hand surgery is widely considered safe following multiple publications.[33–39] Nevertheless, since 2012, there have been six case reports of ischemic events.[40–45]

Epinephrine may be reversed by phentolamine if ischemia is suspected.[37,46] It is considered prudent to avoid the use of epinephrine where blood supply is compromised by primary vascular diseases, such as scleroderma or Berger disease, or by trauma. Phentolamine should be available in the office.

For patients with severe cardiovascular disease, it may be prudent to use a reduced dose and to monitor their care in a hospital environment, although there are series reporting safe use.[47,48] Based on animal studies, caution is advised for patients who are taking tricyclic antidepressants or serotonin-norepinephrine reuptake inhibitors.[49]

Safety of Field Sterility versus Full Sterility

For skin and minor hand surgery procedures, there is little evidence to support many common practices associated with full sterility. Field sterility seems appropriate for most of these types of operations. The literature supporting this claim is well summarized in a recent review article by Yu et al.[50] Nevertheless, common sense dictates that for surgeries where an infection would prove devastating, such as a prosthetic implant, more stringent full sterility in a formal operating room would be appropriate.

Several procedures can be performed in the office with limited field sterility. There is ample evidence that field sterility for simple (nonpermanent implant) hand operations, including closed K-wire fixation, yields low, acceptable infection rates with minimal patient morbidity.[50–58] When antibiotics such as cephalosporins are required, they can be given orally with 90% of the bioavailability of the intravenous route.[59,60] Although an exhaustive list of procedures cannot cover all possibilities, Table 4 illustrates broadly some of

Table 4. Field Sterility versus Full Sterility Should Guide the Location of Office or Operating Room

Office versus Operating Room WALANT
Appropriate procedures for office WALANT
• Excision of benign or malignant skin lesions restricted to skin and subcutaneous disease
• Skin grafting
• Local flap
• Trigger and tendon release
• Tenolysis
• Dupuytren fasciectomy (primary)
• Basic hand and forearm trauma care, including nerve, ligament, and tendon repairs
• Peripheral nerve decompressions (primary)
• Simple hand infections, such as Felon drainage
• Simple wrist tendon transfers, such as extensor indicis proprius to extensor pollicis longus
• Hand fracture management by K-wire
• Mucous cyst and ganglion excision
• Open contaminated hand fracture care
• Finger amputation
• Simple accessory digit
• Early flexor synovitis or fight bite drainage or débridement when the cellulitis is very limited
Consider main operating room sterility for WALANT procedures
• Carpectomy
• Complex revisions for peripheral nerve decompression
• Nerve transfers
• Permanent internal fixation of fractures
• Elective joint implant surgery
• Complex deep forearm surgery, such as multiple forearm tendon transfers
• Severe infection management
• Mangled hand injuries
• Complex compartment syndrome release
• Bone graft and fusion surgery
• Deeply invading malignancy
• Management of lymph node basins and sentinel node biopsy
• Most congenital differences in children except type 1 accessory digit
• Recurrent complex Dupuytren procedure, such as dermofasciectomy

the procedures appropriate for WALANT in the office versus the main operating room.

METHODOLOGY FOR PROVIDING WALANT SURGERY

WALANT has been advocated by Lalonde and others.[1,61,62] The WALANT technique is summarized in Table 5. One of the key pearls for setting up a WALANT process is to bring the first two or three patients together 30 minutes before the start of the schedule. Most WALANT surgeons prefer to inject the patient in a supine position. It takes at least 20 to 30 minutes for lidocaine and epinephrine to reach maximum effect.[63] Therefore, by the time the second and third patient are injected, it will be time to start the first case. Additional patients will arrive for a block in-between cases so that the surgeon is always one or two patients ahead. To increase efficiency, midlevels or qualified residents may administer blocks and close wounds.

A basic procedure room will need access to sterile instruments and a gurney with an arm table or a reclining procedure chair. One medical assistant acts as a circulator while the surgeon may scrub alone. As patients arrive, a staff member must be free to room them for a block. In the senior author's practice, we make use of a midlevel provider or qualified resident to administer the blocks in two clinic rooms that are separate from the procedure room. Further efficiency can be gained when the surgeon is able to move on to the next case while leaving closure and dressings to a midlevel or resident provider. Tables 6 and 7 summarize the WALANT clinic's equipment, rooming, and staff utilization.

The economics of performing office-based WALANT have been well studied,[20–22] and these efficiencies will exist for many hand procedures depending on the expense of the required equipment. It will remain a decision that only the

Table 5. WALANT Technique

WALANT Technique Summary
Equipment
• 10-cc syringe (delivery through a 3-cc syringe may be helpful)
• 30-gauge needle
• 10 cc 1% lidocaine with 1:100,000 epinephrine, 9 cc buffered with 1 cc of 8.4% bicarbonate
• Phentolamine should be available in the rare situations where rescue from epinephrine ischemia may be required.
Tumescent technique
• WALANTtechnique primarily is a process of locally and slowly delivered tumescence of 1% lidocaine and 1:100,000 epinephrine with bicarbonate with an optional local nerve block.
Exception to the tumescent rule
• With the digital block, it is important to avoid more than 2 cc 1% lidocaine with 1:100,000 epinephrine buffered with 8.4% bicarbonate of tumescence between the digital bundles to avoid compression of the vessels. Inject with the needle at 90 degrees to the skin. To achieve dorsal anesthesia proximal to the proximal phalangeal joint, a dorsal injection of 3 cc 1% lidocaine with 1:100,000 epinephrine buffered with 8.4% bicarbonate is also required. A local ring tourniquet is well-tolerated.
Tips
• Warm refrigerated solutions.
• Count down verbally from three before injection. The patient takes a deep breath at two.
• Pinch the skin at the moment of injection and keep pinching until the needle pain is gone.
• Inject slowly with a stable 30-gauge needle.
• Inject 0.5 to 1 cc 1% lidocaine with 1:100,000 epinephrine buffered with 8.4% bicarbonate with the needle at 90 degrees to the skin, then rub the tumescence for 30 seconds.
• Inject the rest over 60 seconds with the needle at a more tangent angle to the skin, keep the needle tip within the area of tumescence, and work outward, slowly.
• It is reasonable to inject more than you think you need.
• Wait 20 to 30 minutes and do not rush.

Table 6. WALANT Clinic Equipment

WALANT Equipment
Surgical equipment on the basic tray
• Four sterile towels
• Two Allis tissue forceps (to secure towels)
• Senn retractor
• Toothed Adson forceps
• Iris scissors
• Mayo scissors
• Knife handle for #15 blade
• One hemostat
• Needle driver
Separately wrapped equipment may include any preferred equipment
• Skin hooks
• Weitlaner and Heiss self-retaining retractors
• Tenotomy scissors
• Rongeurs
• Finger tourniquet
• Freer elevator
• K-wire driver
• A range of absorbent and permanent monofilament and braided sutures
Room equipment
• Reclining procedure chair with arm table
• Operating light, headlight
• A mini c-arm enabling fracture management
• Virtual reality headset available if patient chooses to utilize

Table 7. WALANT Clinic Utilization

Clinic Requirements
Clinic room and staff needs
• One procedure room
• One small instrument cleaning room with autoclave
• Two injection rooms
• One surgeon
• One circulating and rooming medical assistant
• One midlevel or qualified resident performing blocks (optional)

practice can decide as to how much investment can be justified by the increased revenue derived from improved efficiencies and negotiations with payers.

The Use of Virtual Reality to Assist WALANT

Multidisciplinary evidence supports the use of virtual reality for adults and children during painful or frightening procedures, demonstrating both pain reduction and anxiolysis.[64–75] The same effect was confirmed on adults with level II evidence for the use of virtual reality during WALANT procedures.[76] The use of virtual reality with WALANT has been termed wide-awake virtual reality, or WAVR.[32]

CONCLUSIONS

Office-based WALANT has great potential to reduce anesthetic risk and procedure cost and increase access to care. Providers are achieving negotiations with payers to enable office-based surgery. It remains to be seen how regulators and national societies will handle the increase in office-based surgical practices now that WALANT is gaining popularity.

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