Chapter 25 second edition
Wide-Awake Local Anesthesia with No Torniquet (WALANT) for the injured hand

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Introduction

While selected hand trauma cases may be performed under local anesthesia alone, we must not forget that the perioperative experience for our awake patients will fall directly to us, the surgeons to manage without help from our anesthesia colleagues. This chapter will present the authors' experience of managing hand trauma in the office and emergency room setting, using the techniques of Wide Awake Local Anesthesia No Tourniquet (WALANT) with the additional use of Virtual Reality (VR) to assist with the patient experience. We have termed the additional use of VR with WALANT as Wide Awake VR (WAVR).

Injuries to the hands and fingers represent a considerable proportion of emergency room visits. When the downstream loss of occupation is taken into account, they are also the most expensive.[1] Furthermore, hand trauma volumes may be unpredictable and can be interruptive to the normal flow of an elective practice. Health systems have long recognized the need to generate efficient treatment pathways for hand trauma management to mitigate its impact on healthcare resource allocation.[2-4]

When managing a hand injury, anesthesia may be delivered via general anesthesia (GA) or sedation with either regional nerve block or locally delivered tumescence of local anesthetic agents. Local anesthetic nerve block and local tumescence may also be provided without sedation or GA. The location of care is also optional and may considerably affect its timely and convenient delivery. Because lidocaine does not require monitoring or ventilation, the location of care may be independent of the main operating room. Many procedures may be offered in a clean environment using simple field sterility alone, such as the office and emergency room environment.[5] More complex surgery will still be offered in the operating room. Increasingly complex hand trauma care, delivered under local anesthesia both in the main operating room and in the office environment has gained acceptance following the popularization of WALANT.[2,6-10]

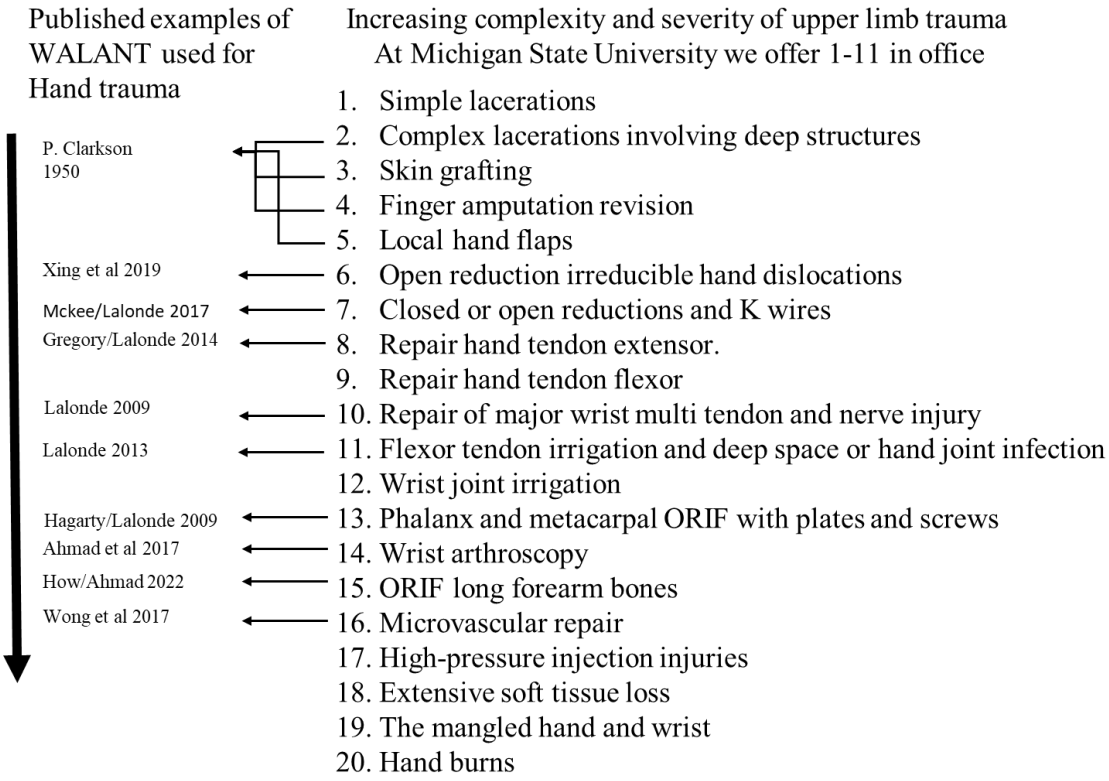

Table 1. Increasing use of WALANT for hand trauma[2, 6-12]

The authors of this chapter advocate office based WALANT for hand trauma because it provides the surgeon with an independent means of addressing the majority of hand trauma pathologies without resorting to the main hospital operating room with its attendant treatment delays, expense, and anesthetic risks.

This is not a new observation, and by the middle of the 20th century hand surgeons were attempting to resolve large volumes of hand trauma in a similar fashion. It is with a sense of historical irony that the authors observe that a similar policy was delivered in Guy's hospital Accident Department in 1950, in their efforts to streamline hand trauma care.[2] Have we really come so far?

P.W Clarkson, "*Wide Awake*" hand trauma without epinephrine, Guys Hospital Accident Department 1950

J.H.W Clarkson WAVR Michigan State University Pediatric Hand Trauma 2020

Figure 1

Figure 1. Guy's Hospital Accident department 1950s vs Michigan State University Hand Management Unit 2020s[2]

Mechanism of action for local anesthetics

Local anesthetic amides and esters are based on mid-19th-century pharmacology derived from cocaine and refined over the subsequent hundred years. There are no alternatives in use. The two commonly used by hand surgeons are lidocaine, with shorter duration and swifter onset, and bupivacaine, which is slower to take effect, longer lasting and more cardiac sensitive. The latter is less suitable for office and non-monitored environments due to the risk of cardiac dysrhythmia but is popular in the operating room providing up to 8 hours of postoperative anesthesia. Bupivacaine is also produced as a liposomal emulsion for slow release over 3-5 days.[13]

Local anesthetic action is mediated via inhibition of voltage-sensitive Na+ channels, thus blocking the nerve action potential from propagating nociceptive stimulus to the brain. For local anesthesia to work, it must be water-soluble to be carried by the extracellular matrix and thus penetrate the surrounding tissue and also lipophilic to penetrate the myelin sheath and interact with the axolemma. To facilitate these two properties, local anesthetic agents have both hydrophilic and lipophilic components.

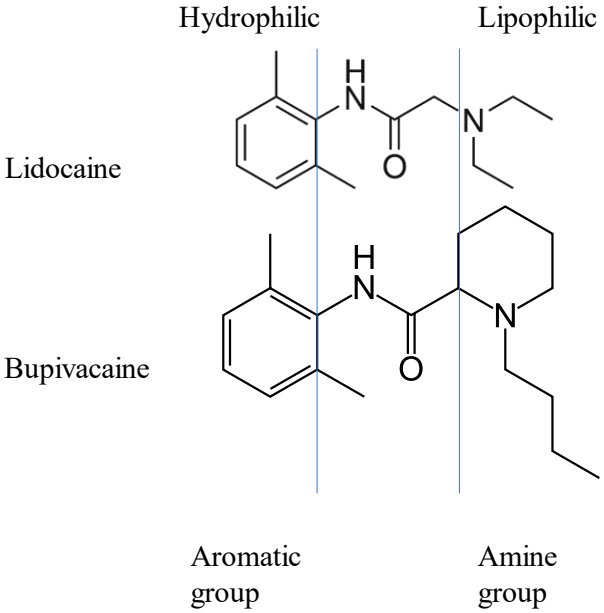

Figure 2

Figure 2. Chemical structure of local anesthetics

Infected hands do not tolerate tumescent technique well when already swollen and the hyperemia will quickly washout the local anesthetic. Furthermore, local anesthetics are weak bases and will become ionized by the acidic environment encountered in infected tissue. The ionized form does not cross the axolemma well, and efficacy is thus reduced in the presence of inflammation and infection.

Esters and Amides

The earliest local anesthetics based on cocaine were esters, which are broken down by pseudocholinesterase leading to the production of para-amino-benzoic acid (PABA), a known stimulus for hypersensitivity reactions.

Amides, first developed in the 1940s, have a swifter onset and much lower hypersensitivity risk. Amides, however, retain the rare potential to produce allergic reactions, due to the preservative methylparaben, which may breakdown to PABA. For patients who are allergic to esters, a preservative-free amide local anesthetic should be used.[14] Caution must be taken if they are used with certain medications such as erythromycin and other macrolides, HIV protease inhibitors, antifungal agents such as itraconazole and calcium channel blockers such as verapamil.

One easy way to identify an amide vs an ester is whether the name has 2 “i”s. If true, it is an Amide. The student pitfall is the use of the trade name “Marcaine” which is really Bupivacaine with 2 “i”s, and hence not an ester.

Esters	
	Cocaine
	Procaine
	Tetracaine
Amides	
	Lidocaine
	Bupivacaine
	Prilocaine
	Ropivacaine
	Levobupivacaine

Table 2. Esters and Amides

Vasovagal response

Individuals may develop a vasovagal response at the time of a needle puncture or any perceived noxious stimulus such as a cast change. In our practice, we inject with the patient sitting up but can quickly lie them back should they report nausea or faintness. Others recommend injections be performed in all patients lying down. During a vasovagal reaction, once lying down, the patient's legs may be elevated to increase circulation to the brain.[15,16]

Local anesthetic toxicity and resuscitation

Bodyweight is commonly used to estimate the risk of systemic toxicity. The plasma levels should not exceed the following:

Lidocaine	• 5 mcg/mL
Bupivacaine	• 1.5 mcg/mL

Table 3. Maximum safe plasma concentration

However, injection site, pregnancy, the use of epinephrine and patient-related conditions such as cardiac, renal or hepatic dysfunction are more important determinants of local anesthetic plasma levels.[17] Classically, the safe dose of lidocaine without epinephrine is 4-5 mg/kg and when combined with epinephrine this may increase to 7mg/kg. For every cc of 1% lidocaine, there is 10mg of lidocaine, so for a 70kg adult, you can expect to inject around 50cc of 1% lidocaine with epinephrine. This is based on estimates from the 1950s and is very conservative, allowing for considerable leeway.[18] More recent estimates are up to 5 times as much, 35mg/kg.[19] This, however, makes the assumption of third space sequestration and up to a third of the solution being removed by liposuction.[20] We do not advise using a higher dose than 7mg/kg when operating away from a hospital operating room setting where the complications of local anesthetic toxicity may be optimally managed.

Lidocaine toxicity will classically present with perioral numbness, facial tingling and a metallic taste in the mouth. Late effects at higher doses include tonic-clonic seizures, followed by ventricular fibrillation and cardiac arrest.

Figure 3

Figure 3. Lidocaine toxicity

Bupivacaine is injected with or without epinephrine at the same dose of 2-3 mg/kg. Because its duration of action exceeds the duration of epinephrine, no significant dose increase is recommended. This is not the preferred agent for WALANT surgery due to its myocardial affinity that may cause fibrillation before central nervous symptoms present. Bupivacaine can produce ventricular arrhythmias heralded by prolongation of PR and widening of the QRS. In the event of cardiac arrest or seizure, ACLS 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.[17] Electromechanical dissociation may be rescued using lipid emulsion.[21] Lipid emulsion (Intralipid 10%) may reverse local anesthetic toxicity by extracting the lipophilic bupivacaine from the myocardium.

Bicarbonate

Local anesthetic agents are mildly acidic with a pH value ranging from 3.3 to 5.5. This acidity may contribute to the injection pain. Bicarbonate has been shown by meta-analysis to significantly reduce pain.[22]

Epinephrine

Epinephrine may be added to local anesthetic to counteract the vasodilation otherwise caused by vessel wall paralysis.[23] Many patients will sense the presence of epinephrine, symptoms will include fearfulness, shaking, and palpitations. 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 its safe use.[24,25] The use of epinephrine should be used with

caution when patients are taking tricyclic antidepressants and serotonin-norepinephrine reuptake inhibitors.[26]

The epinephrine debate

The reintroduction of the use of epinephrine in the hand represents a paradigm shift since the early thousands. 20th-century dogma dictated that epinephrine was "forbidden because of the risk of digital ischemia due to thrombosis of the digital vessels."[27] In keeping with Sterling Bunnel's position "can a jeweler repair a watch in a pool of ink," hand surgery is most easily provided in a bloodless field. By reintroducing epinephrine back into hand surgery, we can reduce our dependence on a tourniquet. Once the pain of tourniquet dependent surgery is removed, the need for sedation and general anesthesia is diminished. The use of epinephrine in hand surgery is now widely considered safe following multiple publications over the past 22 years.[28-31]

However, vascular observation is still required. The lead author has experienced a case of digital tip necrosis with the use of epinephrine in a finger following a crush injury 7 weeks prior. This was fully salvaged using hyperbaric oxygen therapy.[32]

Figure 4

Figure 4. Epinephrine induced ischemic necrosis salvaged by hyperbaric oxygen therapy.[32]

Epinephrine induced digital ischemia has been reported by others, sometimes in association with primary Reynaud's phenomenon.[33,34] These reports remain very rare, but remind us that phentolamine should be available to reverse epinephrine induced ischemia should it develop. We have made use of it once in the main operating room after we discovered an injured vessel during a tendon repair. The tip remained white after wound closure. Then it pinked up after 20 minutes following phentolamine use of 1mg/1ml.

Epinephrine reversal: Inject phentolamine 1mg in 1ml into the site of local injection

Hence, when there is a perceived risk to blood flow, epinephrine may still be avoided.

Previous crush injury with scarring
Scleroderma
Vasculitis
Raynaud's phenomenon
*Unstable coronary heart disease
Severe peripheral vascular disease

Table 4. Contraindications to lidocaine with epinephrine (*in the office setting)

For surgeons using epinephrine, dusky or blanched fingertips at the end of the case are a common early post-operative finding; it is incumbent on the surgeon not to discharge the patient until perfusion improves.

The bloodless field enables WALANT surgery
Avoidance of sedation and general anesthesia
Application in the emergency room and office setting
Increased access for patients and surgeons increases the speed to definitive treatment
Reduced out of hours surgery improves the quality of life for the surgeon
Safe for patients with significant comorbidities
No need to wait 6-8 hours from the last meal
Take regular medication
Decreased costs and staffing, no post-operative anesthesia recovery
Decreased anesthesia risks
No cautery
No "let down" bleeding after tourniquet release reduces surgical time
Avoids tourniquet for patients with lymphedema
Decreased sterile services waste
Improved patient education
Direct functional observation of repaired parts in motion
Longer action of lidocaine
Hydro-dissection facilitates dissection

Table 5. Advantages of epinephrine and WALANT for hand trauma

Cardiac tachycardia and anxiety response
Syncope response
May potentiate pre-existing ischemic pathology[33,34]

Table 6. Disadvantages of epinephrine and WALANT

The office vs operating room debate

Depending on your country or state, most surgeons have some freedom in deciding where they may conduct surgery. The operating room and anesthesia are scarce and expensive and may represent significant obstacles to access for care. What constitutes the minimal acceptable sterile precautions is a hot topic, and in the US, guidelines for office based WALANT surgery were only published in 2023.[35] These guidelines reflect a division between those cases that require a permanent indwelling implant and those that do not. The former is still recommended to perform in the highest sterility environment such as an accredited operating room.

Appropriate 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 debridement when the cellulitis is very limited
Consider main operating room sterility for these WALANT procedures.
• Permanent internal fixation of fractures
• Joint implant arthroplasty surgery
• Bone graft and fusion surgery
• Elective Carpectomy
• Complex revisions for peripheral nerve decompression
• Complex deep forearm surgery, such as multiple forearm
tendon transfers
• Severe infection management
• Mangled hand injuries
• Complex compartment syndrome release
• Nerve transfers
• 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

Table 7. Field Sterility versus Full Sterility should guide the location of office or operating room. (reproduced with permission by Wolters Kluwer Health, Inc[35])

The Association of periOperative Registered Nurses (AORN) is responsible for maintaining operating room accreditation, in the US. In most states and many countries, the office environment does not fall under scrutiny from accrediting bodies. The baseline evidence to support the stringent requirements that are imposed on accredited operating rooms in the United States is published by the AORN, and they cite 239 articles.[36] They state that 18 of these make use of surgical site infection as a clinical outcome. The remaining papers concern nonclinical outcomes such as agar growth plate data. Of these 18 papers only 2 are randomized controlled studies involving a total of 554 patients, which supports the regulation of a $1.67 billion operating room industry in 2020.[37]

WALANT technique

We are fortunate to have a rich literature on WALANT from Dr Lalonde, which combined with our experience is summarized in table 8.[16] The set-up cost and equipment are relatively low compared to the main operating room, see table 9.

Local anesthesia Equipment
10 cc syringe (contains 11cc!)
27-gauge needle
10 cc 1% lidocaine with 1:100,000 epinephrine 9 cc buffered with 1cc of 8.4% bicarbonate
Tumescence
Primarily WALANT technique is a process of locally and slowly delivered tumescence of 1% lidocaine and 1:100,000 epinephrine with Bicarbonate with and optional local nerve block.
Tips
Warm refrigerated solutions
Countdown verbally from 3 before injection
Pinch the skin at the moment of injection
Inject slowly with a stable needle
Inject 0.5 -1 cc 1% lidocaine with 1:100,000 epinephrine buffered with 8.4% bicarbonate with the needle at 90º 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 outwards, slowly.
It is reasonable to inject more than you think you need.
Wait 20-30 mins, don't rush.

Table 8. WALANT technique

Surgical equipment on the basic tray
• Four sterile towels
• Two Allis tissue forceps (to secure towels)
• Toothed Adson forceps
• Senn retractor
• Iris scissors
• Knife handle for #15 blade
• Mayo scissors
• One hemostat
• Needle driver
• Small sterile cup/bowl
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
• 0.28, 0.35, 0.45, 0.54 K wires
• 15 blades
• A range of absorbent and permanent monofilament and braided sutures
Room equipment
• Reclining procedure chair with attached or a free standing arm table
• Operating light and/or headlight
• A mini c-arm enabling fracture management
• Virtual reality headset system for patient education and anxiolysis

Table 9. Surgical equipment and set up for office based WALANT

Pinch and count

Raise a small bleb 0.5 -1cc

Massage

Slowly tumesc, keep the needle within the volume over 1 minute

Figure 5

Figure 5. Injecting tumescent local anesthetic

Exception to the tumescent rule

The exception to this principle is the digital block. It is important to avoid more than 2-3 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 90º 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.

Figure 6

Figure 6. Digital block with 2-3cc only between the vessels

Paradoxical bleeding

Vasoconstriction and a bloodless field may only be achieved where the epinephrine is present in the interstitium around the capillary bed. Paradoxically, paralysis of digital vessel sympathetic fibers by proximal lidocaine injection may create increased distal bleeding despite the presence of epinephrine in the proximal site. Highly fibrotic tissue may also display similar vasodilation due to the failure of the epinephrine to perfuse throughout the field, generating greater bleeding. A good example of this is encountered during elective tenolysis in a densely fibrotic stiff hand.

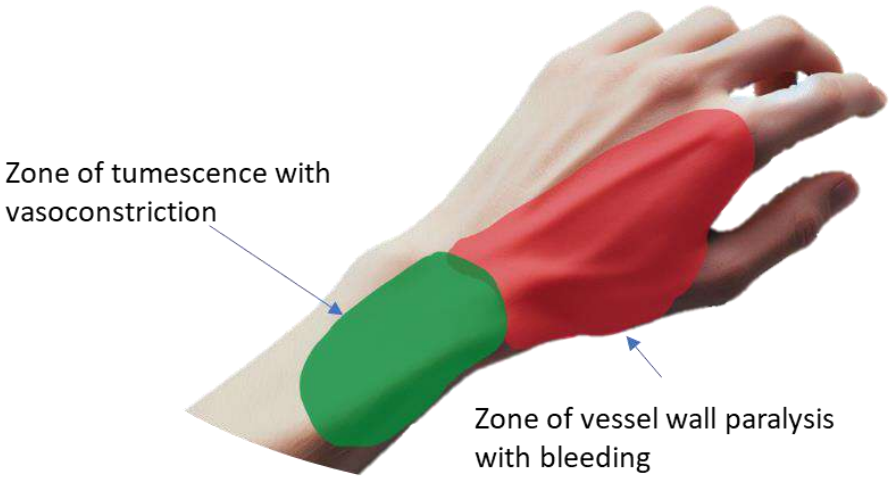

Figure 7

Figure 7. Illustration of paradoxical bleeding

Infection

An infected, inflamed environment will ionize lidocaine and hyperemia will wash it away, causing the efficacy to fall. Perform tumescence proximal to and surrounding the inflamed tissue.

Larger volume local anesthesia

To perform WALANT on large volumes, such as a forearm exploration you may dilute 50 cc 1% lidocaine with 1:100,000 epinephrine buffered with 8.4% bicarbonate up to 200cc with saline and it will retain acceptable efficacy but for a shorter duration.[16] Large forearm regions may be tumesced by blunt cannula once the entry point is first tumesced with a 27-gauge needle. There will be a zone of ischemia within the tumescent area, but distally, where there is effectively a nerve block without local epinephrine you will experience increased bleeding (figure 7).

Metacarpal K-wire blocks

Metacarpal blocks may be achieved with a combination of local tumescence around the fractured metacarpal and planned wire entry points. Make sure the metacarpal on either side is within tumescent zone to ensure that the K wire is not felt as it drives into adjacent bones. Cover dorsal and volar territories.

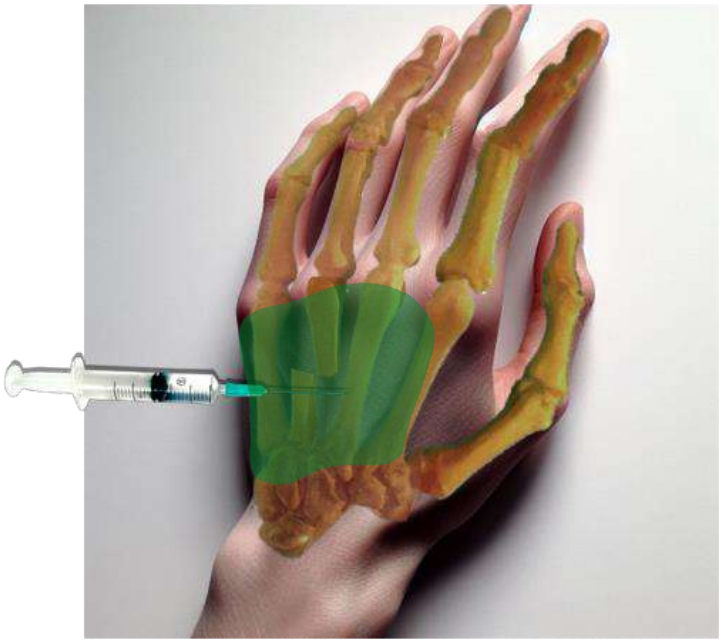

Figure 8

Figure 8. Illustration of metacarpal block

Wide Awake Virtual Reality (WAVR)

Virtual Reality worn by patients is a nascent technology being applied to multiple clinical environments. These include pediatric burn dressing changes, dental procedures, cystoscopy, chemotherapy administration and inpatient invasive procedures.[38-60] In addition, psychological medicine has developed VR exposure therapies to manage common problems such as phobia, chronic pain, and addiction.[61-63]

In 1962, in Guy's hospital, London, Patrick Clarkson observed that "operations for most hand wounds may be performed under local anesthesia; Children and apprehensive adults are best treated under general anesthesia."[27] In 2019 based on our experience using VR for patients undergoing WALANT in the office setting, Hoxhallari et al published the first example of VR being used for this population.[64] Level II evidence from a randomized prospective controlled single-blind trial demonstrated that patients who used VR reported lower anxiety and more fun. In addition, when patients reporting anxiety disorder were studied, they reported lower pain scores during local anesthetic injection. Our larger patient reported outcome study of 199 patients demonstrated that VR improved enjoyment and was most effective at reducing anxiety for patients who have the most anxiety.[65] When environmental anxiety is considered, patients in higher baseline anxiety settings report more anxiety reduction than lower anxiety environments.[66] A putative mechanism akin to the Melsac and Wall Gateway Theory of pain from the 1960's has evolved. For VR, signaling between the hypothalamus and the amygdala may be modified by increasing cognitive load (figure 9).

We can present quality improvement data from Michigan State University in the first half of 2023. We found that 230 patients received WALANT in the office between Jan 1st, 2023 and June 30th, 2023. 80% chose to use VR and 20% elected not to use it. For those elected VR,

95% responded that they felt it reduced their anxiety during the procedure. Overall satisfaction with the treatment experience was greater for those who chose VR 9.7/10 vs 9.3/10 (p=0.03). Enjoyment scores were also higher for those who decided to use VR when compared to those who did not (8.1/10 vs 5.9/10 p=0.0001).

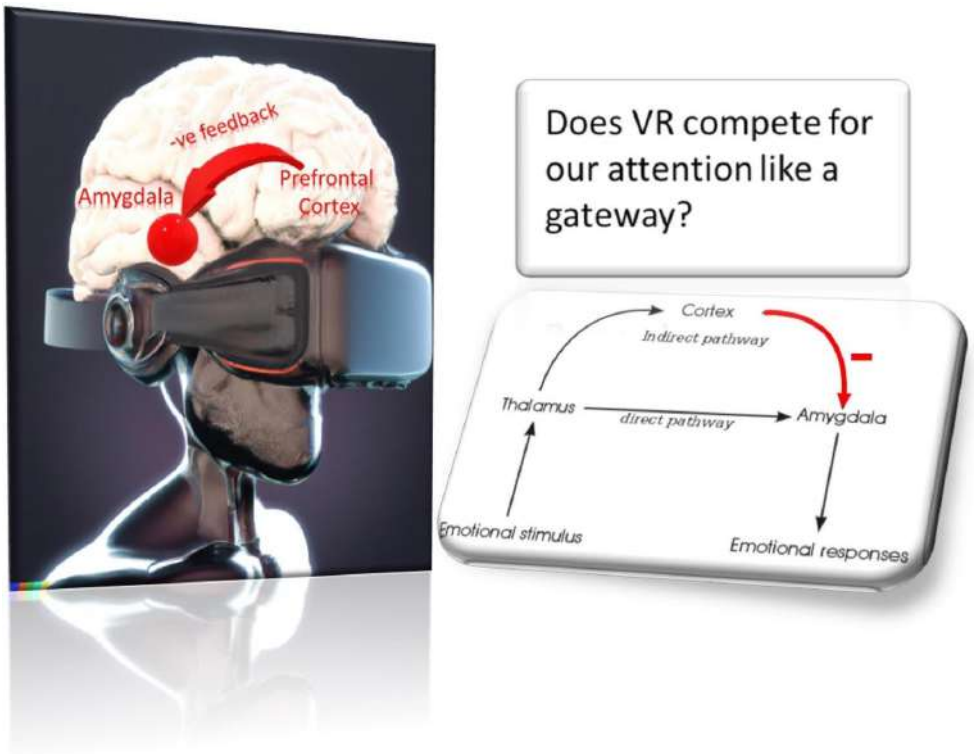

Figure 9 Reproduced with permission by the author

Figure 9. Putative mechanism for the action of VR on anxiety (reproduced with authors' permission[66])

Undergoing further evaluation is the role VR has for children specifically. It is the authors' observation that the pediatric population responded very well in the office when the hospital operating rooms were closed during the Covid 19 pandemic.

Figure 10

Figure 10. A patient relaxing using Wide Awake Virtual Reality (WAVR) before repair of multiple radial forearm extensor tendon and a superficial radial nerve repair

Figure 11

Figure 11. A patient being prepared for exploration and repair of a forearm extensor tendon injury using WAVR

Tips on using a VR experience during WALANT

WAVR is a technique, not just a technology. VR does not remove the surgeon from the relationship, it recontextualizes the experience for the patient provided that correct technique is followed, and the VR system is suitable for your practice.

Figure 12

Figure 12. A patient undergoing WAVR experience

WAVR empowers the patient to choose WALANT

If the patient lacks the confidence to proceed with WALANT, explain that although they will not be put to sleep, they will be taken to another place.

Patient*: "Just put me out doc."*

Doctor: *"How about I put you in another place using virtual reality. It means we can get on immediately to fix your hand. Would you be willing to try this?"*

Encourage the patient to use the VR for a period before surgery begins

In 2023, only a minority of patients have experienced VR. Orientation allows the patient to begin to enjoy themselves and to select the material they want to experience.

Very needle-phobic or pediatric patients need VR for injection

Encourage VR for the injection. Give the patient time on the VR before you start the surgery to allow them to start to have fun. Do not inject without warning, use the count down from 3 technique and perform skin pinch before inserting the needle.

Choice of VR application

If you are using consumer grade commercial VR such as Meta Quest, it is recommended to use a suitable application that enables multiple experiences to be chosen from. YouTube is available in most VR environments, and you can create playlists. The difficulty lies in how to apply the experience to a patient while not having to navigate within the headset to get there. Dedicated medical VR applications are developing fast to meet this need, such as Wide Awake VR Inc.

On entering a room while a patient is wearing VR

Always introduce yourself, we touch their shoulder to indicate we will soon start surgery.

Be sensitive to your choice of VR material

The authors have largely used passive immersive experiences, which have proven effective. We have about 2.5 hours of media on hand. Interaction such as gaming is also available if one-handed. Music is very effective. Ask the patient if they suffer from motion sickness, if they do, choose sedentary material. Ask the patient for preferences, their likes and dislikes. Examples include water phobia and a fear of heights. Account for musical taste and choose experiences based on their preferences. Avoid experiences with a lot of motion such as rollercoaster rides and flight experiences with roll, pitch, and yaw. Most drone material is well tolerated because it is stabilized with a level horizon.

You may need to control the VR experience

For most patients, you need to control what they can choose to experience to help reduce stress as they may not be familiar with the technology. The more VR experienced patients may want to take control of the virtual environment.

Maintain VR immersion

You need to read body language, listen to patient breathing and look for indications of anxiety. You can tell that a patient is well immersed when they look around and their breathing becomes slow and deep. If the patient's attention begins to drift towards the surgery, then they will benefit from reorienting back into their VR. Ask them what they are watching, make use of humor, reference to the current content. Ask them to look about in VR to develop better immersion. We sometimes ask them to answer some simple facts about their experience, such as: Where are you? What can you see? Shall we move ahead to the next experience?

VR sets a stage for conversation and education

Don't forget to talk to the patient, calmly and clearly. You may educate the patient while they watch VR. We also find it useful to use the VR experience to re-context conversation: talk about the show, while also giving post operative medical advice. Monitor the room conversation, they can hear you and everything that is said in the room if not wearing headphones.

Headphones

While relatively few of our patients use headphones, there is a definite population of patients who desire them. Some surgical noises can be anxiety provoking and we have seen syncope stimulated from sound alone.

Noise cancelling headphones of course make it easier to teach your resident or discuss other cases with staff. Unless your system provides voice over technology, you may struggle to get the patient to hear your commands.

VR content can automate education

We have created multiple educational experiences for our patients embedded in the VR environment. VR produces an ideal neutral environment to learn, free from the stress of pre and post operative environments. Patients leave surgery mindful of their post operative behaviors and learning how best to recover and manage pain.

With the first wave of AI applications hitting the market in 2023, AI video production has revolutionized the simplicity of this task with text to video creation.

Some patients decline VR

Expect up to a third of your patients to decline WAVR. This is normal, VR is not for everyone. Beware of the very anxious patient who also declines VR. Encourage them to try it for some time before deciding. This will relax and condition them for the procedure. Very anxious patients who still decline WAVR may not be suitable for WALANT.

The most anxious patients benefit the most from WAVR

We performed a randomized controlled trial and a larger patient reported outcome study, both of which demonstrated that WAVR has greater efficacy in higher anxiety states. In the RCT, patients with an anxiety disorder reported reduced injection pain.[64] In the patient reported outcome study, similar patients reported greater anxiety reduction and joyfulness during surgery.[65]

White Coat Hypertension

Patients regularly present for WALANT with hypertension. Using a virtual experience often normalizes their blood pressure to make it safe to inject lidocaine with epinephrine.

Doing WAVR supine or prone

Most consumer VR devices require the user to be upright and looking forward. When the patient lies down in the real world, they lie down in VR unable to engage with the subject. Newer medical VR devices will adjust the gaze to permit a horizontal gaze in VR when looking upwards in the real world.

Table 10. Tips on WAVR technique

Conclusion

As hand surgeons, we have grown up from the turn of the twentieth century with the availability of general anesthesia. Local anesthesia delivered by injection using painful arm tourniquets while the patient is conscious and frightened has only enabled our overdependence on sedation and general anesthesia. We must strive to implement new techniques such as WALANT and utilize new technologies such as VR to forge a safer, more convenient, and economic pathway for our patients. In 2023, WALANT is now rapidly evolving within elective and traumatic hand surgery.

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