

Wide awake local anesthesia no tourniquet in hand surgery: an analysis of adverse events and complications

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ABSTRACT

Introduction: Anesthesiologist's assistance is considered an inseparable part of most surgical procedures, except for minor operations performed under local anesthesia. In hand surgery, most of the operations can be performed under regional (brachial plexus block) or local (infiltration) anesthesia. These procedures can be carried out by the surgeons themselves, which allows them to operate without the assistance of an anesthesiologist. The objective of this study was an analysis of the efficacy and safety of anesthesia to operations in hand surgery performed by surgeons, without the assistance of anesthesiologists.

Materials and Methods: This analysis was based on records of anesthesia protocols completed by the surgeons who performed the procedure and who operated on the patients. The following variables were considered: efficacy of anesthesia, adverse effects associated with anesthesia and complications.

Results: Over a 10-year period (2013–2022), a total of 16,583 procedures were performed, of which 5638 (34%) were carried out under anesthesia by surgeons, without the assistance of anesthesiologists. The efficacy of these procedures (local and brachial plexus blocks) was 98%. A total of 203 (3.6%) anesthesia-related events were noted, most of which were transient, requiring emergency intervention and without serious consequences. In only 12 cases (0.02%) adverse effects led to cancellation and postponement of the planned operation.

Conclusion: Anesthesia for operations in hand surgery performed by surgeons themselves and without the assistance of anesthesiologists is effective and safe and is associated with numerous benefits for patients, surgeons, and the budget of the medical care system.

Keywords: hand surgery; regional anesthesia; brachial plexus block; WALANT anesthesia.

INTRODUCTION

A new method of anesthesia, local infiltration of the operative field with a mixture of lignocaine and adrenaline (called wide awake local anesthesia no tourniquet – WALANT) has gained increasing popularity in recent years. An important aspect of this technique is to achieve, in addition to anesthesia, ischemia of the operated area, which allows the operation without the use of a tourniquet on the patient's arm. The addition of adrenaline causes spasms of small arteries which reduces bleeding sufficiently enough to allow visualization of most of the small structures, such as digital nerves and arteries of the palmar arch, and safe operation. WALANT anesthesia can be used for various types of hand surgery, both emergency and elective, including hand- and distal radius fractures, soft tissue injuries (tendon, nerve, and ligament repair), and common hand disorders such as carpal tunnel syndrome (Fig. 1), Dupuytren's disease, trigger fingers and ganglion cysts [1, 2, 3]. In tendon surgery, it is possible to check intraoperatively how the repaired tendon slides and whether it does not interfere with the fibrous tendon sheath during finger flexion or extension (Fig. 2). At the authors' institution, WALANT anesthesia has been used for 10 years, and the number of surgeries performed under this anesthesia is increasing every year. The indications for this anesthesia are also increasing [4].



FIGURE 1. WALANT anesthesia for carpal tunnel surgery



FIGURE 2. Repair of a lacerated flexor pollicis longus tendon under WALANT anesthesia. The wide-awake patient is able to control thumb movement intraoperatively

The purpose of this study was to analyze the efficacy and safety of WALANT anesthesia for hand surgery procedures performed at the author's institution.

MATERIALS AND METHODS

Over a period of 10 years (2013–2022), a total of 16,583 operations were performed at the author's institution under regional or local anesthesia (without the assistance of an anesthesiologist), of which number 5638 (34%) were carried out under WALANT anesthesia. The types of diseases or injuries operated on under this anesthesia:

- elective operations:
 - carpal tunnel syndrome,
 - Dupuytren's disease,
 - ganglion cysts,
 - tumors in the upper limb,
 - trigger fingers,
- emergency operations:
 - hand and forearm fractures,
 - tendon injuries,
 - nerve injuries,
 - tendon transfers,
 - skin grafts.

The data for this analysis were obtained from the anesthesia protocols completed by the surgeons who administered the anesthesia and operated on the patients. The standard anesthesia protocol was completed by the anesthesia provider and later completed by the operator. No biochemical tests or electrocardiograms were routinely performed before surgery, except for patients with a history of coagulopathy, in whom a simple coagulation test was performed. Patients who were permanently taking oral anticoagulants (acenocumarol, warfarin, novel oral anticoagulants) were asked to stop this medication at least 5 days before surgery.

Wide awake local anesthesia no tourniquet

Preparation of the mixture

To obtain this mixture, 2 syringes must be prepared: a 10 mL and a 20 mL syringe, 1 mL of adrenaline (1:1000), 10 mL of 2% lignocaine, 20 mL of 0.9% NaCl and 2 mL of 8.4% sodium bicarbonate. A 1 mL of adrenaline is injected into a 10 mL syringe, then the syringe is filled with 9 mL of 0.9% NaCl. This gives a 1:10,000 dilution of adrenaline. Next, 10 mL of 2% lignocaine, 8 mL of 0.9% NaCl and 2 mL of 8.4% sodium bicarbonate are injected into a 20 mL syringe. This results in 20 mL of a buffered 1% lignocaine solution. Next, 20 mL of a 1% lignocaine solution is mixed with 2 mL of 10 mL 1:10,000 adrenaline solution in a 20 mL syringe. This results in 22 mL of a buffered 1% solution of lignocaine and 1:100,000 dilution of adrenaline.

Injecting the mixture

Depending on the type of surgery, 10–20 mL of the mixture was injected into the surgical area. The mixture was prepared

immediately before administration using previously prepared components. Injections were made relatively superficially under the skin, avoiding injection in the vicinity of neurovascular bundles. To reduce unpleasant pain, the injection was performed slowly with pauses between plunger pushes.

RESULTS

During the period analyzed, a total of 5638 operations (34%) were performed under WALANT anesthesia. The average age of the patients was 49 years (range 18–87). There were 3854 elective (68%) and 1764 (32%) emergency operations.

Anesthesia efficacy

The average efficacy of WALANT anesthesia was 98%. Only 103 patients (1.8%) required an additional dose of lignocaine during surgery due to pain at the surgical site. In none of these cases did the surgery have to be canceled, and in none did anesthesiologist assistance become necessary.

Number of adverse events

The list of adverse events is shown in Table 1. A total of 203 adverse events (3.6%) were recorded in the anesthesia protocols. The most common was incomplete anesthesia requiring additional lignocaine infiltration during surgery, which occurred in 103 patients (1.8%). Hypertension was noted in 63 patients, usually immediately after injection of the anesthetic mixture. In most of these patients, elevated blood pressure (>180 mmHg) was measured before WALANT was administered. Twenty-six experienced post-anesthesia discomfort, which was usually transient and resolved in the operating room. None of these patients required additional medication. Prolonged finger ischemia was a very uncommon event observed in only 6 patients. They required careful observation and the signs of ischemia resolved spontaneously in a few hours. No patient required phentolamine injection. Five patients experienced syncope, associated with hypotension. In all of these patients, fluid replacement was administered resulting in quick improvement and operation was postponed. In 12 patients (0.02%), operation was canceled because of adverse events.

TABLE 1. Number of adverse events recorded in WALANT anesthesia (n = 5638)

Adverse event	N	%
Incomplete anesthesia	103	1.8
Hypertension >180 mmHg	63	1.1
Feeling unwell (transient)	26	0.5
Finger ischemia (transient)	6	0.01
Syncope episode	5	0.01
Total	203	3.6
Adverse event resulting in the cancellation of the operation	12	0.02

DISCUSSION

There are reports in the literature of complications after administration of lignocaine with the addition of adrenaline, in the form of ischemia and subsequent necrosis of the finger or part of it. In some patients, adrenaline is not adequately metabolized, resulting in prolonged contraction of the digital arterioles and digital ischemia. However, there is an antidote to such a dangerous situation, namely an injection of phentolamine (Regitine) at the base of the ischemic finger, which quickly turns it pink and prevents damage [3, 4]. Therefore, phentolamine should always be available in the unit where this type of anesthesia is administered.

Sim et al. reported the results of an analysis of 1994 local and regional anesthetics for hand surgery performed by surgeons without the assistance of an anesthesiologist. These operations were performed in a tertiary orthopedic department in Singapore over a period of 4 years. Nearly 100% efficacy of anesthesia was observed. Adverse events occurred in 67 patients (3.4%), none of which were serious or life-threatening. Twenty-one patients (1%) required prolongation of hospital stay for 1–2 years. There were no complications resulting in permanent health damage. The authors emphasize the advantages of not involving medical staff of other specialties (anesthesiologists) and the significant reduction of costs for this type of surgery [5].

Abdullah et al. reported the results of an analysis of 1073 WALANT anesthetics for hand surgery performed by surgeons without the assistance of an anesthesiologist. These operations were conducted over a period of a 5-year period in an orthopedic department of the University Hospital in Kuala Lumpur (Malaysia). Most of the surgeries included carpal tunnel decompression, trigger finger release, resection of hand tumors, and removal of implants (K-wires). The authors found no complications, neither local (finger ischemia) nor systemic [6].

Kurtzman et al. presented the results of a meta-analysis of the literature on the efficacy and safety of WALANT anesthesia for upper extremity surgery. They reviewed 80 papers published in the years 2005–2022 and found a high level of efficacy and safety of this procedure and multiple benefits associated with operating without the assistance of an anesthesiologist. These benefits included increased availability of surgery for patients with comorbidities, reduced waiting time, and reduced cost of surgery. The reviewed studies show that WALANT allows operation on patients of older age, with obesity and other comorbidities, for whom standard anesthesia (general or regional – brachial plexus block) could be dangerous and who (for this reason) are often excluded from surgery by anesthesiologists [7].

There are many other advantages of this type of anesthesia, including reduction of additional medical staff, reduction of time of patients' stay in the hospital, and at the same time it does not worsen their safety, because the rate of adverse events is very low. Another strong argument is that most

patients prefer this anesthesia and “1-day care” surgery. The economic aspect is also important: operations in this mode are 2–3 times less expensive than those performed in the standard way [8, 9, 10].

The strength of this study is the large study group with 5638 patients. It is the largest material published to date, almost 2 times larger than the study published in Lalonde et al. study (3110 persons) [3]. Long-term practice and a large number of patients operated under this anesthesia allow the author to draw confident conclusions about the efficacy and safety of this method of anesthesia performed by surgeons themselves. Results of this study show that anesthesia for hand surgery performed by surgeons alone and without the assistance of anesthesiologists is effective, safe, and is associated with numerous benefits for patients, surgeons, and the budget of the medical care system.

CONCLUSIONS

Anesthesia for operations in hand surgery performed by surgeons themselves and without the assistance of anesthesiologists is effective and safe, and is associated with numerous benefits for patients, surgeons, and the budget of the medical care system.

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