

# Evaluation of the Local Epinephrine Anesthesia without Tourniquet in the Surgical Treatment of Hand Injuries in Adults: About 27 Cases in Sub-Saharan Africa

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## Abstract

**Background:** In sub-Saharan Africa, surgery for hand injuries is usually performed under axillary or general anesthesia. This is often not without consequences. The Wide Awake Local Anesthesia No Tourniquet (WALANT) is, therefore, an anesthetic asset in the surgical treatment of hand injuries. This study aims to share an experience on this technique's effectiveness and to spark interest among African authors and practitioners. **Method:** This prospective study focuses on 27 surgeries of hand injuries carried out with WALANT. The study spanned over nine months (November 2021-August 2022) and included 19 men and eight women with a mean age of 35.4 years (extremes: 19 and 54). There were five (18%) flexor tendon ruptures, three of which were in zone 2, eleven (41%) metacarpal fractures, four of which were open, seven (26%) phalangeal fractures, two of which were open, and four (15%) finger springs. The operated lesions were assessed at a minimum of three months. The pain was assessed using the Visual Analog Scale. The QuickDASH score was evaluated for each patient at the end of the follow-up period. **Results:** Intra-operatively, the mean value of the Visual Analog Scale was 1/10, with extreme values of 1/10 and 3/10. Of the five cases of flexor tendon ruptures, three were located in zone 2 and two in zone 3. The metacarpal fractures were divided into seven closed diaphyseal fractures and four extra-articular metacarpal fractures. Four of the seven phalangeal fractures were oblique diaphyseal, and three were transverse diaphyseal. The treatment of the protruding fingers followed the conventional technique. The assessment of the

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QuickDASH score in the months following surgery showed a score of 11.8 in the first month, 10.3 in the second month, and 5.0 in the third month. **Conclusion:** WALANT is an easy-to-use, unexpensive anesthetic technique that enables shorter operating times. It rarely presents complications. It is recommended for hand surgeries performed with limited technical resources.

## Keywords

Africa, Anesthesia, Hand, Treatment, WALANT

## 1. Introduction

Adrenalized local anesthesia without a tourniquet is a technique that uses a local injection of lidocaine, epinephrine, and sodium bicarbonate [1]. Lidocaine has an anesthetic effect, and epinephrine acts as a hemostatic effect [2]. In sub-Saharan Africa, surgical treatment of traumatic hand injuries is still performed under general anesthesia, sometimes under regional anesthesia (axillary, distal trunk, radial, ulnar forearm, median forearm area's anesthesia) but rarely under local anesthesia [3]. The use of general or regional anesthesia can sometimes cause anesthetic accidents [4] [5]. WALANT is known to have very few complications, apart from hypersensitivity to anesthetic agents [6] [7]. The use of WALANT is still confidential in France, but based on reports, some surgeons see it as an advantage in their practice and, for some, as autonomy from anesthetists [8]. Many authors recommend the use of WALANT in hand surgery [9]. In Africa, however, only a few studies have been devoted to this anesthetic technique in hand surgery. Therefore, the authors of this study decided to experiment with the method in a sub-Saharan hospital. This study aims to share experiences on the effectiveness of this technique to generate interest among African authors and practitioners.

## 2. Patients and Method

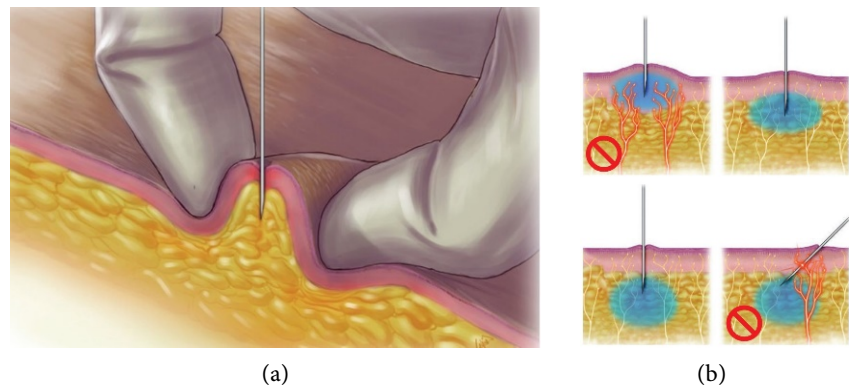
This prospective, multi-center, single-operator study included 27 hand injuries operated on with WALANT. It was a nine-month study (November 2021, August 2022) including 19 men and eight women with a mean age of 35.4 years (extremes: 19 and 54). Patients treated at another hospital and patients lost to follow-up were excluded from this study. All hand injuries were monolateral. The patients were all manual workers. The leading cause was accidents at work in 14 (52%) cases, followed by accidents at home in nine (33%) patients. The average admission recording time was 6.3 hours (extremes: 1 and 13). There were five (18%) flexor tendon ruptures, three of which were in hand area N°2 and two in hand area N°3, 11 (41%) metacarpal fractures, four of which were opened, seven (26%) phalangeal fractures, two of which were opened, and four (15%) projecting fingers (Table 1). The average time to surgery was 1.4 days (extremes: 1 and 4). All injuries were treated surgically under WALANT.

**Table 1.** Socio-demographic characteristics.

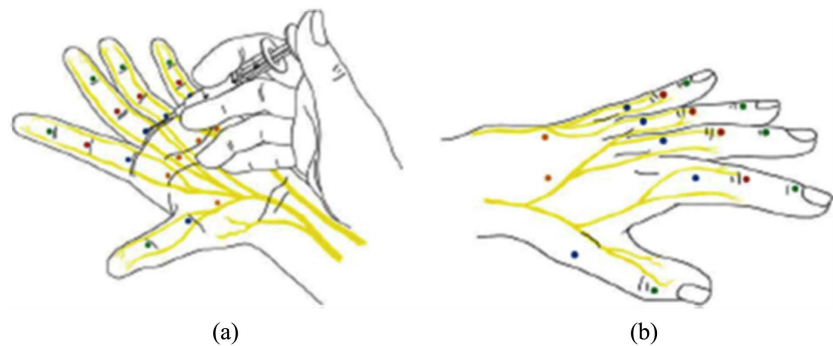
Characteristic	n	%
<b>Gender</b>		
Male	19	70%
Female	8	29%
<b>Age</b>		
Mean	35.4 years old	
Extremes	19 and 54	
<b>Etiology</b>		
Work accident	14	52%
Domestic accident	9	33%
Other	4	14%
<b>Admission delay</b>		
Mean	6.3 hours	
Extremes	1 and 13	
<b>Flexor tendon rupture</b>		
	<b>5</b>	<b>18%</b>
Hand area no 2	3	11%
Hand area no 3	2	7%
<b>Open metacarpal fracture</b>		
	<b>11</b>	<b>41%</b>
<b>Close phalangeal fracture</b>		
	<b>7</b>	<b>26%</b>
<b>Operative delay</b>		
Mean	1.4 hour	
Extremes	1 and 4	

## 2.1. The Anesthesia Technique

The solution contained nine volumes of 1% lidocaine hydrochloride adrenalized to 0.0005% to one volume of sodium bicarbonate. Bupivacaine can also be used as a replacement for lidocaine [10]. The maximum recommended dose was 7 ml/kg [11]. Adrenaline acts as a hemostatic agent [2]. Sodium bicarbonate reduced the acidity of the solution and thus minimized pain upon injection [11]. A sufficient volume of up to 3/4 of the solution was injected into the area to be anesthetized to create an extravascular block to keep it exsanguinated and thus omit a tourniquet [12]. The injection was made with a fine 27-gauge needle. The skin was punctured perpendicularly (**Figure 1(a)** and **Figure 1(b)**). The solution was injected slowly, intradermally, and then into the dermis [1]. A delay of 30 minutes between the injection and the incision was recommended, which was necessary to reach the anesthetic peak [3]. The anesthesia time in WALANT was up to 10 hours in the fingers [13]. Different injection sites in hand have been described (**Figure 2(a)** and **Figure 2(b)**) [10].



**Figure 1.** (a) and (b): The injection process [2].



**Figure 2.** (a) and (b): Different injection sites in hand [10].

Flexor tendon ruptures were repaired with a suture using the Mac-Larney technique [14]. Fractures of the metacarpals were reduced and then fixed by pinning, preceded by trimming if the skin was open. Fractures of the phalanges were reduced and immobilized by syndactylization. Protruding fingers were treated by sectioning the basal AO pulley.

## 2.2. Post-Operative Follow-Up

In the immediate postoperative phase, metacarpal fractures and tendon ruptures were immobilized in a plaster cast for three weeks. Skin healing was monitored on an outpatient basis. No patients were hospitalized. Follow-up visits were aimed at monitoring the evolution of the pain, any signs of local infection, and the recovery of manual joint amplitude. The pain was assessed using the Visual Analog Scale (VAS). The VAS was scored out of 10 and estimated by the patients. The follow-up also included radiographic images on day-1, day-21, and day-60 postoperatively. Rehabilitation of the wrist and fingers was systematically performed. The sessions began on day-1 for the fingers with a protrusion and on day-15 as soon as the plaster cast was removed for tendon ruptures and fractures. It was continued for as long as possible until the hand's joint amplitudes were fully obtained. The results were evaluated clinically and functionally. It was carried out on day 60 and had a minimum follow-up of 120 days. It consisted of a meticulous clinical examination and a control X-ray for fractures. The clinical

examination looked for complications such as local infection, skin flaps at the incision sites, a possible lack of range of motion. Once a month and for three months after the operation, the disability score of arm, shoulder, and hand (QuickDASH) was assessed in each patient (Table 2) [15] [16]. The data were analyzed using Epi Info software version 3.5.1.

### 3. Results

#### 3.1. The Pain

VAS assessed the pain based on each patient’s subjective response. It was evaluated during the surgical procedure, four hours afterward, and then at the follow-up visits. Thus, during the operation, the average VAS was 1/10, with extremes of 1/10 and 3/10. Beyond the 4-hour post-operative period, the average VAS was 2/10, with extremes of 2/10 and 5/10. The 4-hour time limit was when the WALANT disappeared from the injection site [9].

#### 3.2. Ruptures of the Flexor Tendons

Of the five cases of flexor tendon ruptures, three were in zone 2 and two in zone 3. The approaches were palmar using the **Bunel** technique [14]. The wounds had

**Table 2.** QuickDASH score [15].

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1) Open a tight or new jar	0	1	2	3	4
2) Do heavy household chores (e.g., wash walls, and floors)	0	1	2	3	4
3) Carry a shopping bag or briefcase	0	1	2	3	4
4) Wash your back	0	1	2	3	4
5) Use a knife to cut food	0	1	2	3	4
6) Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.)	0	1	2	3	4
7) During the past week, to what extent has your arm, shoulder, or hand problem interfered with your normal social activities with family, friends, neighbors, or groups?	NOT AT ALL 0	SLIGHTLY 1	MODERATELY 2	QUITE A BIT 3	EXTREMELY 4
8) During the past week, were you limited in your work or other regular daily activities due to your arm, shoulder, or hand problem?	NOT AT ALL 0	SLIGHTLY LIMITED 1	MODERATELY LIMITED 2	VERY LIMITED 3	UNABLE 4
9) Arm, shoulder, or hand pain	NONE 0	MILD 1	MODERATE 2	SEVERE 3	EXTREME 4

QuickDASH Score = [(sum) × 1.1] × 5/2; a missing response is added as the remaining average.

healed after a fortnight. There were no cases of local infection. The skin sutures were removed on day 21, and hand rehabilitation sessions were started immediately. The rehabilitation was continued for as long as possible until full flexion-extension of the fingers was achieved. No tendon sutures were released. Two cases of rupture in zone 2 were taken back to the operation room for tenolysis.

### 3.3. Fractures of the Metacarpals

They were divided into seven closed diaphyseal fractures and four extra-articular metaphyseal fractures. The diaphyseal fractures were osteosynthesized in two cases using the Foucher technique and in three patients using the Iselin technique [14]. The wounds had healed by day 15. The splints were removed on day 30 and the pins on day 45. The physiotherapy sessions were then started, allowing the hand to recover flexibility. The fractures had completely consolidated on average of 120 days.

### 3.4. Fractures of the Phalanx

Four of the seven phalangeal fractures were oblique diaphyseal, and three were transverse diaphyseal. They were reduced and immobilized on a tongue depressor by syndactyly. The two open fractures were trimmed beforehand. There were no cases of tendon disinsertion. The wounds had a good skin healing process, complete after 21 days. The syndactyly was removed on day 30, followed by digital rehabilitation. The fractures had consolidated on average by day 60, confirmed by radiographic images.

### 3.5. Spring Fingers

The approach was palmar in all cases. Conventional treatment consisted of sectioning the basal pulley in hand area N° 2, the AO pulley. The wounds healed within two weeks. There was no sign of local infection or recurrence. Physiotherapy was not necessary here.

### 3.6. Assessment of the QuickDASH Score

See [Table 3](#).

## 4. Comments

Although various lesions were operated on under WALANT in this study, three parameters should be assessed: pain evaluation (VAS) during and after the operation and the recovery of the function of the operated limb after the procedure.

**Table 3.** Three-month postoperative QuickDASH score averages.

	M1	M2	M3
<b>QuickDASH score</b>	11.8	10.3	5.0

Legend: M1 = First month postoperative.

The pain assessment procedures followed the recommendations of Campard *et al.* [17]. In this study, the average intraoperative VAS of 1/10 (extremes: 1/10 and 3/10) was close to that of Apard *et al.* (1/10, extremes: 0/10 and 3/10), also intraoperatively. The latter also noted that none of their patients had called to report pain [18]. The patients included in the work of Campard *et al.* reported comfort during surgery [17]. Elsewhere, Dukan *et al.* had a similar study on two groups of patients, A and B. They found a mean VAS of 0.2/10 ( $\pm 0.1$ ) in group A, 0.3/10 ( $\pm 0.1$ ) in group B and a VAS of zero during the surgical procedure without the need for additional analgesics [19]. These results were close to those found in this study. These results show that patients are very satisfied with the pain around WALANT surgery.

The QuickDASH score assessed the function of the operated limb. **Table 3** summarizes the mean scores for this evaluation. These results were close to those of Gummesson *et al.* [16]. It follows that the WALANT did not influence the recovery of the function of the operated limb after the procedure. In addition, during the operation performed under WALANT, sensitivity was abolished, but motor skills were retained. This made it possible to control the repair of tendons in hand, for example, by active movements [20] [21].

Finally, this study did not evaluate the procedure cost and patient and surgeon satisfaction. However, the authors agreed that patients and surgeons were always satisfied with the WALANT procedure. Patients do not need pre-operative check-ups, including blood tests, X-rays, or electrocardiograms. Only informed consent is required. The time spent in the recovery room is considerably reduced [10]. Regarding the cost of the procedure, in an analysis of the direct costs of carpal tunnel release, Leblanc *et al.* determined that the price in the outpatient setting was one-quarter of that of the same procedure in a hospital operating room [22]. Nelson *et al.* compared the cost of Dupuytren's surgery in an outpatient setting to that in the hospital operating theatre. They said that the costs in the operating theatre were 13 times higher than in the outpatient setting [23]. The financial cost of the procedure has always been negligible compared to other methods of anesthesia [6] [10].

## 5. Conclusion

WALANT is a simple, less expensive method of anesthesia and allows for shorter operating times. It rarely presents complications but offers a wide range of indications in hand surgery. It is a very easy-to-use anesthesia method and is practically adapted to working conditions with limited technical facilities. This is why WALANT is highly recommended for hand and upper limb surgery in black Africa.

## Conflicts of Interest

The authors declare no conflict of interest.

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