



Repair of Flexor Tendons of the Hand by WALANT Method

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Abstract

Introduction: Hand injuries involving flexor tendons associated with neurovascular damage should be considered an orthopedic emergency in all trauma centers.

Objectives: To evaluate the benefits of the WALANT Method in the repair surgery of flexor tendons of the hand, in patients operated in the Orthopedics and Traumatology service of the Calixto García University Hospital, in the period from June to December 2021.

Method: An observational, descriptive, prospective and cross-sectional study was conducted in 25 patients with traumatic flexor tendon injuries, operated by the WALANT Method, by Basic Work Groups 2 and 3 using as variables age, sex, pain during infiltration and transoperative, associated injuries, complications and hospital stay.

Results: 100% of patients presented pain during infiltration rated on the VAS scale of mild (0-3), while in the transoperative period all had a pain of 0. Transoperative bleeding in 80% of patients was less than 10 ml. Of the total number of patients, only five had associated neurovascular lesions. The hospital stay in most patients was less than 12 hours.

Conclusions: The WALANT method is a safe and reliable therapeutic alternative for hand flexor tendon repair surgery, significantly reducing anesthetic complications, transoperative bleeding and hospital stay.

Keywords: WALANT; Flexor Tendons; Local Anesthesia

Introduction

Injuries to the flexor tendons of the hand are common and should be considered a true surgical emergency. These prevent the patient from flexing the fingers and therefore the overall function of the hand is significantly affected. Flexor tendons are specialized structures that transmit movement from the strength of muscles. Therefore, in the face of the imbalance of the flexor and extensor appliances, muscle strength is lost. The clamp and pressure are the main altered functions that interfere with the different activities of daily life. Finger flexor injuries usually take about three to seven months to recover [1,2].

Conventionally this type of surgery is performed with the application of tourniquets to obtain an adequate hemostasis and create a surgical field visually free of blood. Prolonged ischemia of the upper extremity generates a drop in blood pH that added to mechanical compression at the tourniquet level causes intense pain in most patients, which generates the need to perform procedures under general anesthesia, with deep sedation or brachial plexus blocks [4,5].

Traditionally, the use of epinephrine for infiltration in acral parts has been contraindicated due to the fear that it will cause necrosis

secondary to vasoconstriction. However, at present, there is ample evidence about the safety of using epinephrine on the hand including the fingers.³ This has made it possible to apply the WALANT method (*Wide Awake Local Anesthesia No Tourniquet*) in almost all surgeries performed on the hand and wrist. Studies over the past decade have proven that vasoconstriction is safe in the hand, including the fingers, which has eliminated the need for a tourniquet in most hand surgeries [6,7].

The WALANT method, where an anesthetic, in this case Lidocaine, is combined with Bicarbonate and Epinephrine, has become a trend in our specialty, where the same surgeon applies anesthesia [8].

The objective of this research is aimed at evaluating the benefits of the application of the WALANT method in the repair surgery of flexor tendons of the hand, in patients operated in the Orthopedics and Traumatology service of the Calixto García University Hospital, in the period from June to December 2021.

Material and Method

An observational, descriptive, prospective study was conducted to demonstrate the effectiveness of the WALANT method in traumatic injuries affecting the flexor tendons and peripheral nerves of the hand. Applied in a total of 25 patients operated by the Basic Work Groups (GBT) 2 and 3, of the Orthopedics and Traumatology service of the Calixto García Hospital, in the period from June to December 2021.

The universe of study was constituted by 40 patients, which correspond to all those operated on for presenting flexor tendon injuries of traumatic cause by the two GBT in which the research was carried out in the aforementioned period. The study sample consisted of 25 patients who met the following inclusion and exclusion criteria

- **Inclusion criteria:** Patients with flexor tendon injuries of the hand of traumatic cause; who wish to participate in the study and give their informed consent to undergo this surgical method.
- **Exclusion criteria:** Presence of skin diseases at the surgical site; Decompensated chronic noncommunicable diseases; Psychiatric patients; Patients allergic to some of the components of the anesthetic formula.

In all patients, the following were analyzed as study variables: age, sex, pain assessment using the Visual Analogue Scale (VAS) during infiltration and transoperatively, amount of transoperative bleeding quantified in milliliters (ml), associated lesions presented, complications and hospital stay.

The results were expressed through tables and graphs, determining the total and percentage results for each study variable.

The ethical principles of the research were adhered to and all patients signed informed consent before undergoing surgery.

Results

In the period from June to December 2021, 40 patients were surgically operated on for presenting tendon lesions associated with neurovascular lesions at the “General Calixto García” University Hospital, by Basic Work Groups No.2 and 3, of which 25 patients met the inclusion and exclusion criteria indicated. Of these, 18 were male (72.0%) and 7 were female (28.0%). The age group most represented in both sexes was 19-39 years, with a total of 17 patients (68%). (Table 1).

Demographic variables	No.	%
Age (years)		
19-39	17	68
30-39	2	8
40-49	3	12
50-59	3	12
60 and over	0	0
Sex		
Male	18	72
Female	7	28

Table 1: Distribution of patients with tendon and neurovascular lesions operated with WALANT method according to sex and age.

Total: 25 patients

Source: Medical Records Department of Medical Records Calixto García University Hospital.

The assessment of pain was performed using the Visual Analogue Scale (VAS), which is the most used internationally,³ as a psychometric scale because pain is a subjective sensation and it is didactic, very easy to understand by patients, who collaborate in the medical interrogation. During the anesthetic infiltration all patients presented a VAS of 0-3, referring this pain during the first puncture, then in the rest of the entire infiltrative process the pain decreases significantly and is reduced to 0.

During surgery, all patients had a pain VAS of 0. In the case of the 5 patients with associated neurovascular lesions, 3 of them presented paresthetic sensations during neurorrhagia, in which it was required to perform an infiltration with local anesthetic, using 0.5 ml of 2% Lidocaine, in the epineurium, disappearing these paresthesias.

The quantification of bleeding in patients included in this study was performed after anesthetic infiltration using the WALANT method, and previous bleeding from vascular lesions was not included. In 20 patients, for 80% of the total, bleeding of 5 to 10 ml was observed, with only one patient with a bleeding of 21 to 30ml, for 4% of the sample. (Figure 1)

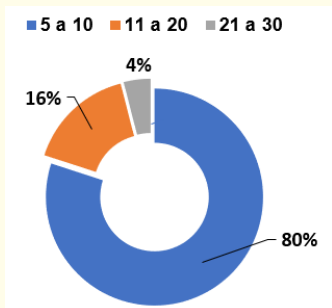


Figure 1: Quantification of bleeding in ml of patients operated by WALANT anesthetic technique.

All patients included in this study, with injury to the flexor tendons, were of traumatic origin, with objects such as knives, saws, glass fragments and polishers, so some of these patients presented associated neurovascular lesions. Of the 25 patients, 5 presented neurovascular lesions, constituting 20% of the sample; 4 of these lesions combined in ulnar nerve and artery and median nerve. Only one patient had an isolated lesion of the median nerve.

In relation to the complications presented, it is important to note that in our study we did not have any patient with complications related to the WALANT anesthetic method, either with the drugs that make it up or the infiltrative technique used. Of the sample studied, only one patient presented surgical wound infection and two reported postoperative pain, common complications to occur in this type of lesions, regardless of the anesthetic method used.

In relation to the hospital stay, 64%, for a total of 16 patients, remained less than 12 hours in the institution, mainly related to the application of intravenous antibiotic therapy in this period of time for the prevention of infections. Only one patient required an admission of up to seven days, due to presenting an infection of the surgical site, which was controlled with the antibiotic treatment used in this period. (Figure 2).

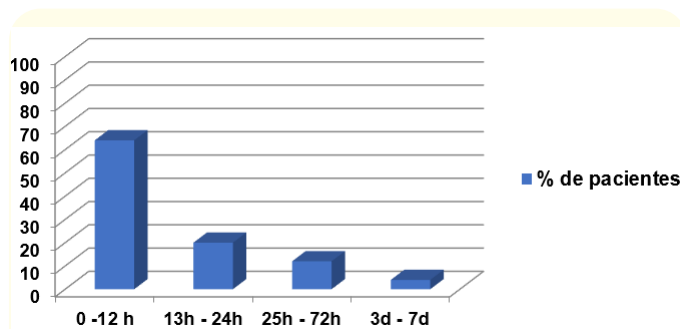
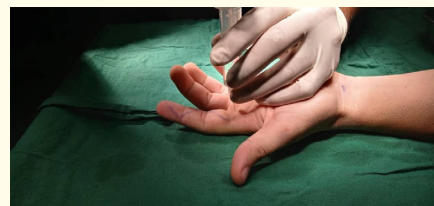


Figure 2: Distribution of patients according to hospital stay.

We perform the walant method based on the weight of the patients, using 7 mg per kg of weight with this type of solution. Diluting epinephrine at doses of 1 in 100000. And the bicarbonate at 0.1ml per milliliter of walant solution. To perform surgeries for flexor tendon injuries in the hands, we prepare 15 to 30 cc in a general way and depending on the area where the injury has occurred and the extent it has. The surgeries were performed in the minor surgery room of our hospital, after sepsis and antisepsis before performing the surgery, respecting 30 minutes after applying the anesthetic technique to achieve a better vasoconstriction and tumescencia of the area. Nylon 4-0 was used for the tenorrhaphy, with base 4 ebras for central tendon and nylon 6-0 for peritendon. Active transoperative flexoextension movement was performed, correcting any remaining gaps, advantages that can be seen with this method. All patients were immobilized with dorsal splint with wrist in neutral with passive flexion of the fingers until 4 weeks.



Discussion

The results of the research carried out have been compared with other similar publications carried out both nationally and internationally. It is important to highlight the few investigations available so far in Cuba due to its novelty [9,10].

Injuries affecting the upper extremity and specifically the hands come to suppose, as described in some studies, a third of occupational injuries and reach a fifth of the causes of disability processed by occupational accident¹. The hands are fundamental for the realization of the daily activity, from the most rudimentary to the most technical and sophisticated. Most manual jobs require the use of potentially dangerous machinery [11-13].

In accordance with the international literature, most of these lesions reported in our sample occur in patients within an age range of 19 to 39 years, and mostly males with more than 70%. This is because most high-risk manual jobs are performed by young men. Similar results were obtained in his study P. Ruterana¹, in 1995, where he refers that the age range in which these lesions were greatest was from 25 to 45 years, and in the same way, mostly male patients [14-16].

In surgeries performed under general anesthesia, patients are under sedation, having no perception of pain during anesthetic induction and transoperative procedure. With the WALANT anesthetic method, the patient is very awake, which allows the assessment of pain during anesthetic infiltration using the VAS scale, obtaining in all cases a range of mild perception. (0 to 3). This same range of pain is reported by Lalonde [16] in a series of 3110 operated patients, arguing that following its principles during infiltration the patient should not present a range of pain greater than mild [17].

In all patients included in the study, they maintained a perception of pain during surgery using VAS of zero, which also coincides with the results obtained by Lalonde¹⁶ in its series. At this point, he shows us that the WALANT anesthetic method may have a greater effectiveness for the treatment of these lesions than general anesthesia or regional block; since the patient is awake and painless complying with the requests of the surgeon in the movements of the hand, which allows to optimize the surgery, verifying that there are no gaps in the tenorrhaphy and neurorrhagia [18].

The hand is very vascularized so from its beginnings Bunnel described that “operating a bleeding hand is equivalent to repairing a clock in an inkwell”; Hence, most of the surgeries performed in it so far were performed by applying tourniquets at different levels of the upper limb. These tourniquets are annoying and painful for patients operated under local anesthesia, can sometimes cause tissue damage and can not be placed for more than one continuous hour; In addition, once the tourniquet is removed, bleeding from the skin and soft tissues occurs in a group of patients, requiring the implementation of hemostasis techniques. The WALANT anesthetic method avoids the use of tourniquets, due to the effect of the epinephrine used. In this way, the entire limb is not deprived of blood supply, but a reversible and temporary vasoconstriction occurs, during which it is possible to apply hemostasis techniques if necessary. In the study, 80% of patients had transoperative bleeding of less than 10 ml. Similar results have been published by Yi-Syuan Lia [4] in his study of flexor tendon repair with WALANT technique where 87.5% of his patients had minimal bleeding, less than 10 ml. [19].

Of the 25 patients diagnosed with flexor tendon injuries, who participated in our study, only 20% of them presented associated neurovascular injuries. These lesions comprised mostly mixed lesions of the artery and ulnar nerve. In relation to the study carried

out by Grant S [7], with a total of 41 patients, neurovascular injuries also presented as the main associated lesion, although it also reports other complications such as fractures and skin loss, which were not present in our study [20].

Another advantage reported for the application of the WALANT method in flexor tendon surgery is the reduction of the time of hospital stay of patients, which was also corroborated in our research where most patients were discharged in the first 12 to 24 hours of surgery, reaching 64% of the sample studied. Unlike tendon repairs performed under general anesthesia, in which the patient is regularly hospitalized for at least 72 hours after surgical treatment, the reduction of the time spent in the hospital is a novel and significant aspect to highlight for this type of surgical intervention, since it is related both to the reduction of complications associated with general anesthesia and the possibility of infections. intrahospital, as well as the reduction of hospital costs and greater satisfaction for the patient and their families [20].

Conclusions

The application of the WALANT Method in patients with injuries of the flexor tendons of the hand proved to be an effective, safe and reliable therapeutic alternative to be used in our environment that allows to significantly reduce transoperative pain and discomfort, being able to perform tendon repair with the patient awake complying with the requests of the surgeon in the movements of the hand, which allows us to optimize surgery and contribute to surgical correction according to the traumatic injuries presented.

It was demonstrated that with the application of the WALANT method, transoperative bleeding is reduced in most patients to less than 10 ml, reaching 80% of the sample studied and the hospital stay is reduced in relation to conventional anesthetic methods, being able to discharge within 12 hours after the surgical act to 64% of patients, which contributes to reducing the possibility of hospital-acquired infections and hospital costs with greater satisfaction for the patient and their families.

Conflicts of Interest

The authors unanimously declare the absence of conflict of interest.

Authors' Participation in the Research

The authors participated in the research in an equitable way, each of them contributing what corresponded to them according to their specialty and area of knowledge.

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