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Research Article

Evaluation of Wide-Awake Local Anaesthesia No Tourniquet (WALANT) in Repair of Hand Flexor Tendon Injuries Regarding Hemostasis, VAS and Patient Satisfaction

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Abstract

Background: A large number of hand surgeons are now using wide-awake local anesthesia with no tourniquet (WALANT) instead of traditional surgery using a tourniquet and sedation. Lidocaine and epinephrine plus sodium bicarbonate are the drugs injected for both anesthesia and hemostasis. Methods: This prospective study was performed in Minia University Hospital, Plastic and Reconstructive Surgery Department on 30 Patients undergoing hand primary flexor tendon repair surgery based on inclusion and exclusion criteria. **Results:** Thirty patient were involved in our study. Satisfactory results were achieved in 83.8% of the cases. The duration of surgeries was 45-180 minutes. During this duration there was no pain or blood loss. For the blood loss, the mean ± SD was 64.2±15.5. No necrosis occurred due to epinephrine use in any case. There was a significant difference in VAS score value & VAS grades during WALANT injection, at 3hrs postoperative and 6hrs postoperative compared with during operation and 1hr postoperative with a P value <0.001. **Conclusion:** The use of the wide awake technique (WALANT) with avoidance of tourniquet provides an optimal hemostatic field with low blood loss, suitable for long operations with lower pain (VAS score) in the involved cases.

Keywords: wide awake technique (WALANT), Flexor tendon repair, VAS score.

Introduction

Many hand surgeons are now using WALANT (wide-awake local anesthesia and no tourniquet) instead of classic surgery with a tourniquet and sedation. The administered medications for anaesthesia and hemostasis are lidocaine, epinephrine, and sodium bicarbonate[1.]

The WALANT technique has many advantages, including the avoidance of tourniquet usage, which protects against nerve damage and pain caused by limb ischemia. There is no necessity for preoperative fasting or medication discount-inuation. This is especially important for patients with chronic conditions such as diabetes, heart disease, or renal disease who could benefit from surgical interference but would normally require very careful preoperative preparation before taking general anesthetics[2-4].

It was previously thought that epinephrine injections caused digital ischemia and necrosis. That was a common belief prior to 1948. Several researches demonstrated that epine-phrine was utilized and did not produce infarction or necrosis. Even when a large dosage (1:1000) of epinephrine was unintentionally injected into a finger, no occurrences of digital infarction were documented. As a result, it is unlikely that epinephrine at a concentration of 1:100000 could cause digital necrosis.

Although both are rare, inappropriately applied digital tourniquets have been associated with more incidences of digital infarction than lidocaine and epinephrine usage. Adrenaline use has recently gained popularity [5-7].

The WALANT approach, which uses a mix of common medications, has had great results over the previous decade. It has several significant advantages, including shorter operating times, lower visual analogue scale VAS score, the ability to visualize and assess the strength of tendons repair intraoperatively, and the elimination of the usage of tourniquet in hand surgeries and its accompanying complications. Additionally, allows for quick patient discharge from the hospital and decreasing the need for general anaesthetic, making it cost-effective and affordable. [1, 8].

The visual analogue scale (VAS) has been widely used and is regarded as a reliable and sensitive method of expressing pain intensity. Furthermore, because of the minimum language translation difficulties, it takes very little time to complete and enables for cross-cultural comparisons. When utilizing the VAS, it is typical to assume that it offers a linear measure of pain. The VAS is a straight line with the boundaries carrying a verbal description of each extreme of the symptom to be evaluated. It provides a continuous scale for subjective magnitude measurement. The line is typically 10 cm long and vertical [9].

Patients and methods

This prospective study were done at Minia University Hospital, Plastic and Reconstructive Surgery Department on 30 Patients undergoing hand primary flexor tendon repair surgery based on inclusion and exclusion criteria.

Inclusion criteria: Age between (12-60) years old, flexor tendon injury zone 2, 3, 4, 5.

Exclusion criteria: Patient refusal, associated fractures, associated nerve injury, vascular disorders, patients complaining of bleeding disorders, associated traumatic tissue loss, patient that show hypersensitivity to anaesthetics, psychiatric disorders.

Operative Design:

All patients and / or their guardians were be sign an informed written consent. It was signed before the beginning of the study. Any unexpected risk appearing during the study was explained to the patients and the committee on time. All the records were confidential. The results of this study were used only in scientific purpose. The participation was voluntary and the patients could discontinue participation at any time without penalty or loss of benefits. Postoperative questionnaire was be given to the patients to report their impression and evaluate the technique.

Initial Assessment:

Thirty patients complaining of acute injuries at zone II,III,IV or V flexor tendon were attending at emergency department and clinical evaluation was done including:

History taking

The patient ages were from 12 to 58 years old, men represented the majority of cases (22 cases) while women were 8 cases. Patients didn't complaint of any comorbidities. 20 patients were with left hand injuries, 10 patients were with right hand injuries. In our study, 30 patients had 41 digits affected. The involved digits were distributed as follows: 11 little finger (26.8%), 11 ring finger (26.8%), 9 middle finger (22%), 7 index finger (17.1%), 3 thumb (17.3%).

Management:

I) First Aid:

Wash of contaminating substances and temporary covering the wound by sterile dressing . Investigations especially hemoglobin, TLC, PC & INR was done.

II) Injection of WALANT (figure 1):

WALANT preparation:

WALANT solution consists of 100 ml of lidocaine 1%, 1 ml of epinephrine (1:1000) and 10 ml of 8.4% sodium bicarbonate (total 111 ml).

N.B: The lidocaine 1% is usually not available so we dilute the lidocaine 2% by adding equal volume of normal saline (0.9%). And to save the resources the preparation was: 100 ml normal saline + 1 ml adrenaline (1:1000) and we took equal volume from lidocaine 2% in addition to 1ml sodium bicarbonate 8.4% for each 10 ml of this mixture.

We inject about 10 ml of the mixture (till the tissue become tumescent) in the palm about 2cm proximal to the site of trauma in the subcutaneous tissue under the superficial

palmar fascia .Then we inject the 3 ml at the base of each affected digit.
Also we inject 2 ml in the subcutaneous tissue of the proximal and middle phalanges midway between the two digital bundles and we inject 1 ml in the distal phalanx in the same manner. The patients was in a supine position during injection. We waited for 25 to 35 minutes between the injection of the local anaesthetic and beginning of the operation to have ideal hemostasis.

Hemostasis (volume of blood loss) was assessed as the following:

a) The Gauze is approximately 50cc if fully soaked and 10-15cc if semi-soaked.

b) The Towel is approximately 150cc if fully soaked and about 75cc if semi-soaked.

c) The amount of blood from suction tube.

Visual Analogue Scale 10 (figure 2)[10]:

The Visual Analogue Scale (VAS) composed of a line with 2 endpoints representing the extremities limits such as 'no pain at all' and 'pain as bad as it could be'. The patient was told to express his pain level on the line between the two endpoints by a mark.
The subject's level of discomfort was then measured as the interval between "no pain at all" and the mark. Assessed pain for patients group as a baseline by (VAS) visual analogue scale which is a valid and reliable measure of chronic pain intensity, as well as acute pain measurement using a ruler.
The score of pain intensity was determined by patients providing a mark between 0-10 cm with score from 0-4 cm mild pain. 5- 7 cm moderated pain and severe pain.
We translated the VAS into Arabic (the Arabic version of VAS) to simplify scoring for our Arab patients (**figure 3**).

Statistical analysis design:-

The analysis of the data was carried out using the IBM SPSS version 25 statistical package software. Normality of the data was tested using the Shapiro Wilk test. Data were expressed as mean ± SD and minimum and maximum of range for parametric quantitative data and by median (IQR) for non-parametric quantitative data, in addition to both number and percentage for qualitative data.

Chi-square test was used to compare categorical variables. Wilcoxon Signed rank test was used to compare non-parametric quantitative variable (VAS) between different times. Correlation between variables were done using Spearman's correlation. P-value less than 0.05 was considered statistically significant.

Results

In this study the number of included patients was 30 patients, all cases were Rt. handed. In 10 cases, the trauma was at Rt. hand (33.3%) while in 20 cases, the trauma was at Lt.. hand (66.7%). 21 cases (70%) were with one finger affection while 9 cases (30%) with more than one finger affection.

The duration that was taken till reaching full action of WALANT effect was 25-35 minutes with Mean ± SD = 31.7±3.3. We were waiting this duration before starting the surgery. The duration of surgeries from skin incision to skin closure was range from 45-180 minutes with Mean±SD= 84±36 minutes. During this duration there was no pain or blood loss.

The results show that the Range of blood loss was (40-105) with Mean ± SD = 64.2±15.5. No necrosis occurred due to epinephrine use in any case.

VAS score results which were assessed during injection of WALANT solution, intraoperatively and every hour for 6 hours postoperatively Table (1), (2) & Figure (4): During injection of WALANT solution 4 cases (13.3%) had no pain, 25 cases (83.3%) had mild pain (score 1-4) and 1 case (3.3%) had moderate pain (score5-7) with median = 2 and IQR = (1.8-3). All cases had no pain intraoperatively and for 1hr. postoperatively. 3hrs postop. 4 cases (13.3%) had no pain, 25 cases (83.3%) had mild pain (score 1-4) and 1 case (3.3%) had moderate pain (score5-7) with median = 2 and IQR = (1.8-3).

At 6 hrs postop. 16 case (53.3%) had mild pain (score 1-4) and 14 cases (46.7%) had moderate pain (score 5-7) with median = 4 and IQR = (4-5). No cases complained of severe pain. There was significant difference in VAS score value and VAS grades during WALANT injection, at

3hrs postoperative and 6hrs postoperative compared with during operation and 1hr postoperative with a P value <0.001. There was insignificant weak correlation between age & sex in relation to VAS.

Table (1): Shows VAS score during injection of WALANT solution, intraoperatively and every hour for 6 hours and correlation in between:

		Descriptive statistics N=30
VAS during injection of WALANT solution	Median IQR	2 [a] (1.8-3)
VAS during operation	Median IQR	0 [b] (0-0)
VAS 1hr postop.	Median IQR	0 [b] (0-0)
VAS 3hrs. postop.	Median IQR	2 [a] (1.8-3)
VAS 6hrs. Postop.	Median IQR	4 [c] (4-5)
P value		***<0.001****

Superscripts with different small letters refers to significant difference between each two times

Table (2): shows VAS score during injection of WALANT solution, intra-operatively and every hour for 6 hours in grades and correlation in between:

		Descriptive statistics N=30
VAS grade during injection of WALANT solution	No Mild Moderate	4(13.3%) [a] 25(83.3%) 1(3.3%)
VAS grade during operation	No Mild Moderate	30(100%) [b] 0(0%) 0(0%)
VAS grade 1hr postop	No Mild Moderate	30(100%)[b] 0(0%) 0(0%)
VAS grade 3hrs postop	No Mild Moderate	4(13.3%) [a] 25(83.3%) 1(3.3%)
VAS grade 6hrs. Postop	No Mild Moderate	0(0%) [c] 16(53.3%) 14(46.7%)
P value		**<0.001***

Superscripts with different small letters refers to significant difference between each two times

Table (3): shows patient's satisfaction about surgery and about its outcome

	Patient satisfaction		P value
	Not satisfied	Satisfied	
About surgery	5(16.7%)	25(83.8%)	***<0.001****
About outcome	6(20%)	24(80%)	***0.001****

There was highly significant increase in the patient's satisfaction about surgery and outcome in functional outcome and cosmosis with highly significant statistical difference ($p < 0.01$).

Figures

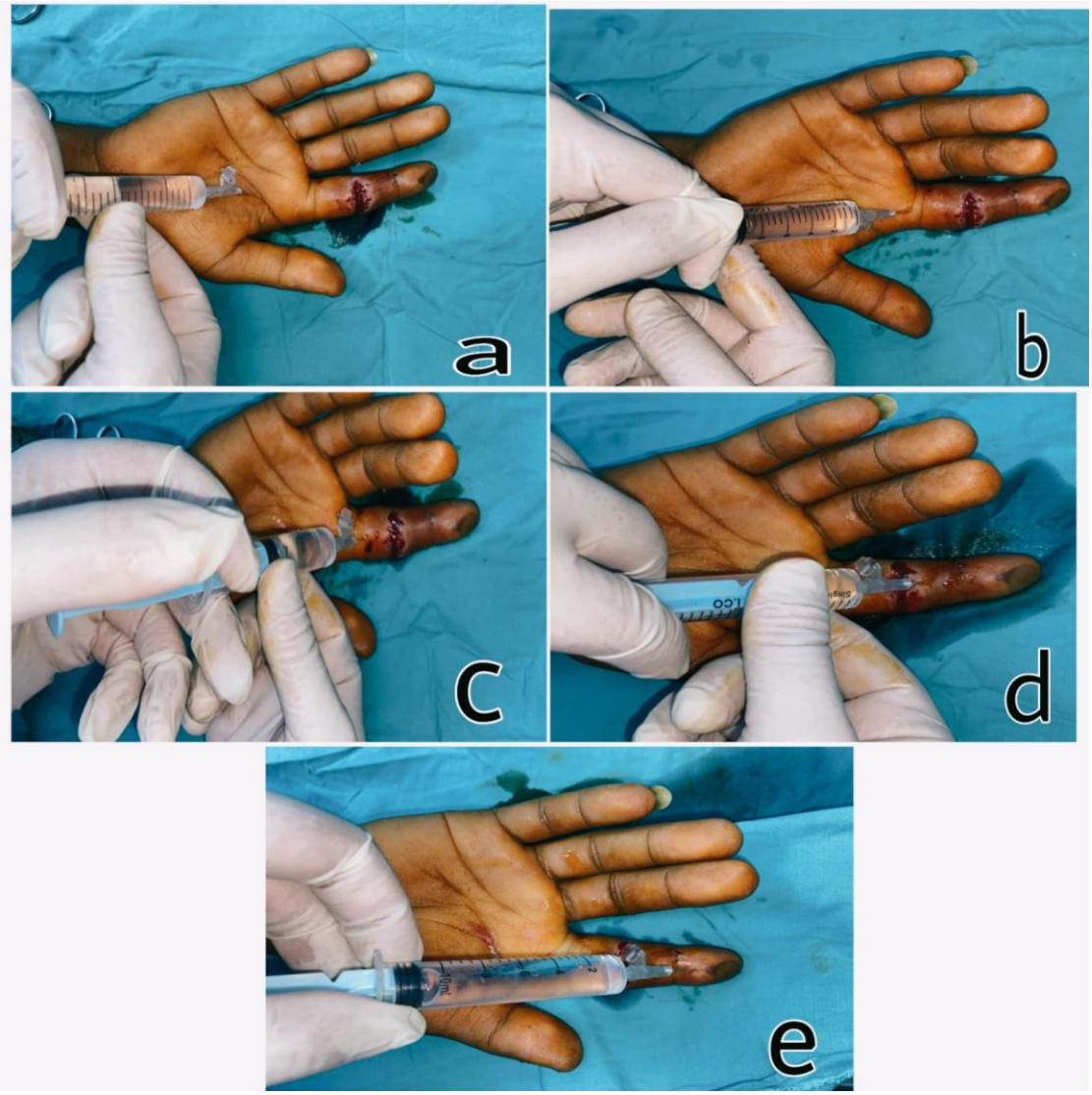

Figure (1): shows WALANT injection technique

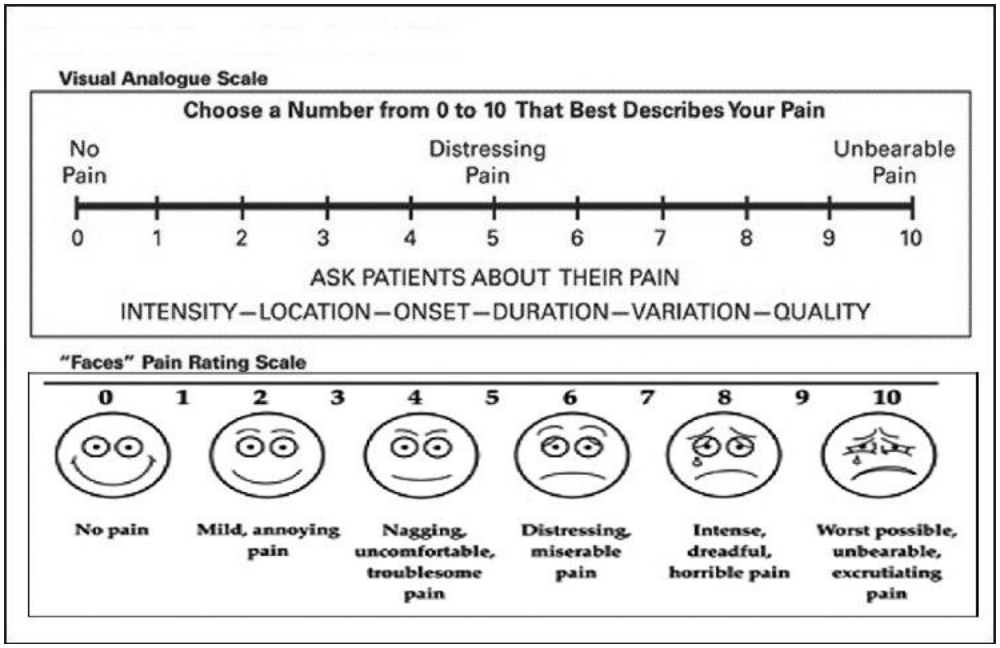

Figure (2): VAS Quoted from Wewers and Lowe, 1990

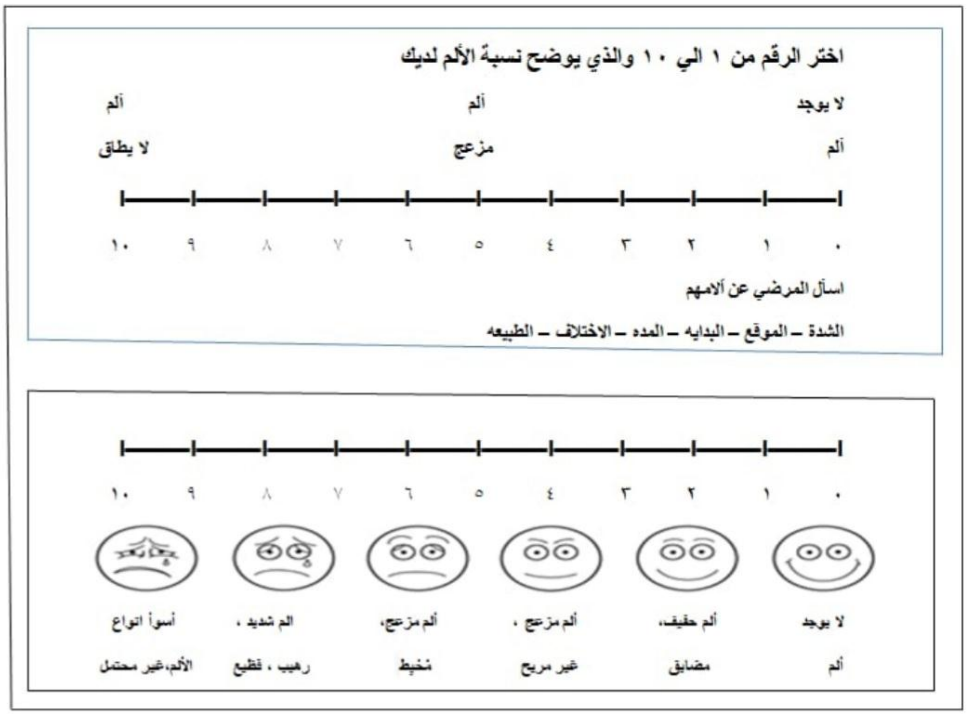

Figure (3): shows Arabic version of VAS

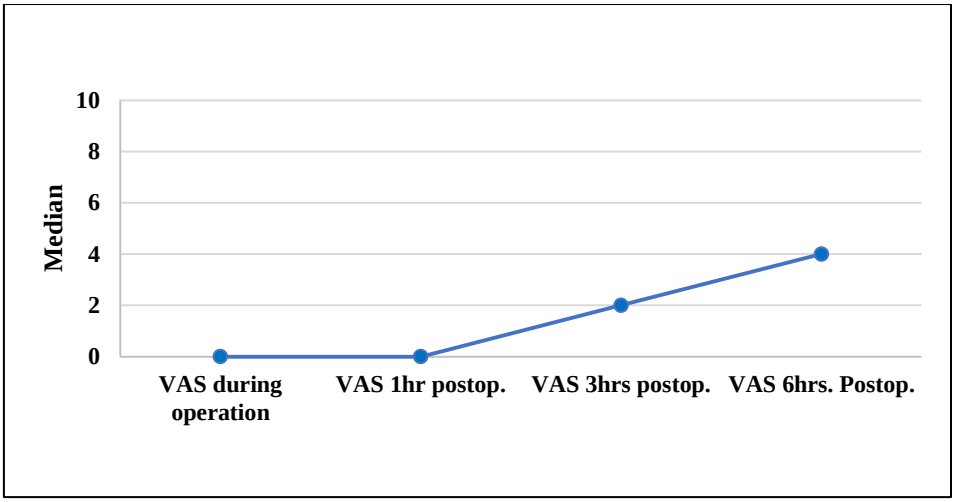

Figure (4): shows VAS score during injection of WALANT solution, intraoperatively and every hour for 6 hours.

Discussion

Lalonde et al.,[11] propagated the use of epinephrine with anaethesia in hand surgery almost 20 years ago. This made surgeons able to operate without using tourniquet and, therefore, without any sedation measures. The WALANT technique has now been used in a wide range of surgeries, including tendon repairs, tendon transfers, local flap reconst-ructions and fracture stabilizations of the upper extremity [12].

In our study, the sample consisted of 30 patients (41digits) with the mean age of all patients was (33.4 ±14) years. Regarding gender of the patients, the majority (73.3%) of patients were males; while (26.7%) were females. The sample size in this study is close to that described by Duru et al., (61 patients with 67 digits) (43 male and 9 female) with a mean age of 36.8 and Kadhum et al., (63 patient) (41 male and 12 female) with a mean age of 38.5±14.4years. That was more than that reported by Khaled et al., (22 patients, 32 digits)[12-14].

By observation of the age and sex distribution in our study which goes with the study described by Duru et al., (the age mean of 36.8, 43 male and 9 female). The most of cases are men of young age [12]. This is may be due to the fact that this category is working more and more prone to injuries.

The time that was taken till reaching full action of WALANT effect was 25-35 minutes with Mean±SD= 31.7±3.3. And the duration of surgery from the skin incision to skin closure was range from (45-180 hours) with mean ± SD =84±36 hours. After reaching full action of WALANT effect, we achieved a very good bloodless field (hemostasis) without using of tourniquet. The volume of blood loss was range from 40-105 ml with Mean ± SD = 64.2±15.5 ml .No necrosis occurred due to epinephrine use in any case. This is supported by Abdelshaheed & Mohammed et al.,[15, 16].

Abdelshaheed, mention that The time that was taken till reaching full action of WALANT effect was 20-35 minutes with an average of 28 minutes. And the operative time was 44-200 minute average of 102 minutes. The volume of blood loss was range from 17-28 ml [15]. We supposed that this difference in blood loss was due most of Abdelshaheed cases were elective case while ours were acute cases.

In our study, discomfort response of patients, assessed using the visual analogue scale (VAS) score, during injecting the wide-awake anesthesia had a median score of 2 with a range of 0-4 while during the surgery itself the median was zero revealing that the approach is almost painless that is encourging the surgeons to use WALANT profusely as it is satisfactory

for both patients and surgeons. This was similar to Khaled et al.,[14], Abdelshaheed[15].

Abdelshaheed mention that, the VAS during local anaesthetic injection was 0–3 with the mean ± SD was 1.7± 0.8. And in Khaled et al., it the range was 0-4 with a median score of two. Postoperative VAS score was 0–1 with the mean ± SD was 0.7± 0.5 [14, 15].

In this current study, the VAS score 3 hrs postop. 13.3% of cases had no pain, 83.3% of cases had mild pain (score 1-4) and only 3.3% had moderate pain (score5-7) with median = 2 and IQR = (1.8-3). While 6hrs. postop. 53.3% of cases had mild pain (score 1-4) and 46.7% had moderate pain (score 5-7) with median = 4 and IQR = (4-5). No cases complained of severe pain. This is supported by Lee et al.[17].

Lee et al., mentioned that on comparing WALANT technique versus Conscious Sedation in minor hand surgery regarding VAS score that he reported that the pain in postoperative period was markedly lower in the WALANT group until 1 day after operation, and there was no considerable difference thereafter. The pain scores was significantly lower with the use of WALANT especially at first 6 hours after surgery. Analgesia administration was markedly lower with WALANT use until 2 days after operation, and there was no significant difference thereafter. Similarly, Okamura et al 18 found significant differences in pain (VAS) at the following times: during operation period, first hour (hr) postoperative, two hrs, four hrs, six hrs, and eight hrs. Statistically significant changes (> two points on VAS score) emerged in the early postoperative interval and two hrs following the operation.

Conclusion

The use of the wide awake technique (WALANT) with avoidance of tourniquet provides an optimal hemostatic field with low blood loss, suitable for long operations associated with lower discomfort (VAS score) among study participants.

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