

# Comparison of Effectiveness in Flexor Tendon Hand Repairs between WALANT Technique and Conventional Method

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**Objective:** To compare the effectiveness in flexor tendon hand repairs between wide-awake local anesthesia no tourniquet (WALANT) technique and conventional method.

**Methods:** The study design of this study was randomized controlled trials (RCTs) in 92 patients with flexor tendon repairs. Patients were divided into 2 groups: 46 were operated under the WALANT technique and 46 controls were operated under the conventional method. All study subjects have hand tendons surgery at the Department of Orthopedics, Roi Et Hospital from June 1, 2018 to December 31, 2019. The pain score, total blood loss, duration time of surgery, and patient satisfaction were recorded. The statistics analyses were used descriptive and Mann-Whitney U test.

**Results:** The comparison of effectiveness in flexor tendon hand repairs between WALANT technique and the conventional method were found no significant differences between two groups in terms of pain score preoperative ( $p=0.941$ ), pain score intraoperative ( $p=0.774$ ), total blood loss ( $p=0.291$ ), operative time ( $p=0.078$ ), and overall satisfaction ( $p=0.274$ ).

**Conclusion:** This study revealed that the effectiveness in flexor tendon hand repairs between WALANT technique and conventional method in terms of pain score, total blood loss, duration time of surgery and patient satisfaction is not significantly different.

**Keywords:** Flexor tendon repairs, WALANT technique, Conventional method

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## Introduction

Hand surgeries such as tendon repair, lump surgery, wrist surgery, and carpal tunnel releases can be performed under wide-awake local anesthesia with no tourniquet (WALANT technique). This method can perform in the outpatient department as one-day surgery, using minimal staff, with a low rate of complication<sup>(1-3)</sup>. It is safe in patients who have medical co-morbidity and can reduce overall medical costs. Several reports and clinical scientific studies revealed that injection of lidocaine plus epinephrine was widely used in hand surgery for the WALANT technique<sup>(4)</sup>.

The WALANT technique is safe and effective for hand and wrist surgeries. Patient satisfaction is high because of the avoidance of preoperative testing and hospital admission. Postoperative recovery is rapid, and procedures can be done in outpatient settings, resulting in substantial savings in time and money. It is well known that the WALANT technique is superior to the conventional method in terms of hospitalization and cost. A study of Huang et al., reported that patients in the WALANT group had shorter mean

hospitalization, but greater mean blood loss and there was no difference in operative time compared with conventional surgery. A study of Gunasagaran et al., found out that WALANT technique associated with better patient comfort but there was no difference in operating time and blood loss between the WALANT technique and the conventional method. And a study of Ruxasagulwong et al., revealed that WALANT offered better comfort for patients and less total blood loss while providing effective anesthesia and patient safety as with the conventional technique<sup>(5-9)</sup>.

Roi Et Hospital carried out flexor tendon hand repairs using the conventional method on 125 patients in 2016, and 104 patients in 2017. Before the operation, significant time was spent on the preparation of the patient, operation room, and staff. From literature reviews, we found that the WALANT technique provides more convenience for flexor tendon hand repair because it requires no sedation or general anesthesia during surgery, prevents possible side effects and medical complications, and eliminates intravenous injection and medical waste cost<sup>(1,2,10,11)</sup>. The objective of this study was to compare the effectiveness of the anesthesia in flexor tendon hand repairs between the WALANT technique and conventional method in the patients at Roi Et Hospital.

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## Methods

This study was randomized controlled trials (RCTs). Patients who had tendons surgery at the Department of Orthopedic Surgery, Roi Et Hospital from March 1, 2018 to December 31, 2019 were enrolled. The inclusion criteria were patients with age more than 18 years old, fully conscious, and could communicate in the Thai language. The sample sizes of this study after calculation were 46 cases per arm. In total, 60 male and 32 female patients were included in the study.

The data were collected for demographic data, underlying diseases, cause of injuries, the zone of injuries, number of tendons injuries, and complications of patients after surgery. The pain score of patients during surgery was described as 0-1 is no pain, 2-3 is least pain, 4-5 is mild pain, 6-7 is moderate pain, 7-8 is severe pain and 9-10 is excruciating pain. Patients' level of satisfaction was assessed by using five points-Likert Scale questions. The scoring of the scale was: 1-least, 2-minimal, 3-moderate, 4-medium high, and 5-high. Total operation time is the time taken from skin incision to completion of skin close. Total blood loss was collected as the weight of gauze at the end of the operation (mg).

### **Randomization**

Following our methodology, all patients at the eligibility criteria were interviewed for participation and the informed consent was done by the research coordinator. This study used a parallel arm approach composed of flexor tendon hand repairs by WALANT technique group and conventional methods. All patients were randomized as 1:1 and the randomization was performed by a systematic random sampling technique. The first case was counted for the conventional method, the second case was counted for WALANT technique and alternately counted until 46 cases per arm were completed.

### **Surgical preparation for WALANT technique**

The 30 ml solution used for the WALANT technique consists of 2% lidocaine and 1:100,000 epinephrine. The injection was done around the wound to make vasoconstriction for preventing bleeding during surgery. Preparing and surgical repairing tendons were done as the usual methods. After the operative procedure, the splints were applied. The splints were removed at 6 weeks after surgery. The pain assessment was done during the preoperative, intraoperative and postoperative period using pain scale measurements. Each patient's blood pressure, respiratory rate, heart rate, oxygen saturation, and preoperative intravenous antibiotic were obtained.

### **Surgical preparation for the conventional method**

Each patient's blood pressure, respiratory rate, heart rate, oxygen saturation, and preoperative intravenous antibiotic were obtained. The process includes patient NPO about 6 hours, pre-operation

investigation, prepare surgery set with anesthesiologist, I.V. set and surgery in the operation room with team (orthopedic surgeon, anesthesiologist, anesthetist nurse, nurse, and practical nurse), general or regional anesthesia according to anesthesiologist, arm tourniquet for prevent bleeding during surgery, clean the wound, cut necrosis, repairing tendons, stitches, and splint for help tendons healing as same as the usual procedure did on the WALANT group. After surgery, the patients were admitted overnight for observation, pain assessment preoperative, intraoperative and postoperative complications were recorded, and discharged within 24 hours postoperatively. Then follow-up 2 weeks and cut silk suture of the wound and remove the cast after 6 weeks of surgery.

### **Data collection process**

This study was approved by the Roi Et Hospital Ethical Committee for Human Research and was permitted to collect data and conduct the research by the director of Roi Et Hospital. Subsequently, the following steps were planned and managed: researcher team meeting, randomization cases and control, WALANT technique protocol, interviewer training, and staff preparation for every unit involved which were Orthopedic Outpatients Unit for WALANT technique, Department of Orthopedic, Operating Room, Anesthesiology Unit. Likewise, all medical procedures for the conventional method were prepared.

### **Statistical analysis**

Descriptive statistics were percentage, mean, and standard deviation. For inferential statistics, the Mann-Whitney U test was used to find the differences between the two groups. The statistical significance was set at p-value < 0.05.

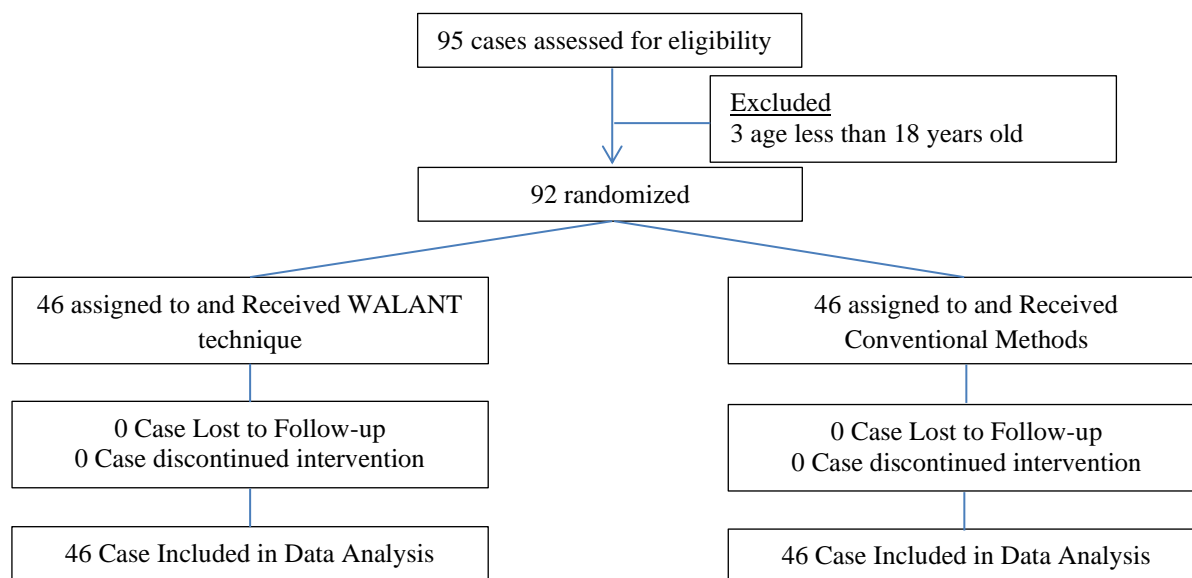
### **Ethical consideration**

This research was approved by the Roi Et Hospital Ethical Committee for Human Research (Ethics Approval Number: 044/2561).

## Results

### **General characteristics of patients**

There were 46 patients surgery by using WALANT technique for anesthesia, 63.01% were male, 47.08 years was mean age. Out of 46 patients who underwent surgery using the conventional method of anesthesia, 67.39% were male, 46.13 years was mean age. In the WALANT group, most causes of injuries were by knife (91.30%). Most injuries were in zone II (52.17%) and 2 tendons (50.00%). The complication was adhesion (2.17%). In the conventional method group, most causes of injuries were by knife (89.13%). Most injuries were in zone II (50.00%) and 2 tendons (56.52%). The complication was adhesion (4.35%). Data was shown in Table 1.



**Fig.1** Consort diagram of the randomized controlled trial.

**Table 1** General characteristics of patients.

Variables	WALANT Technique n (%)	Conventional Method n (%)
Sex		
Male	29 (63.04)	31 (67.39)
Female	17 (36.96)	15 (32.61)
Age (Years)		
≤30	7 (15.22)	16 (34.78)
31-40	6 (13.04)	1 (2.17)
41-50	16 (34.78)	3 (6.52)
50-60	9 (19.57)	12 (26.09)
60-70	2 (4.35)	11 (23.91)
>70	6 (13.04)	3 (6.52)
Mean (SD)	47.08 (15.79)	46.13 (18.97)
Min: Max	20:72	19:75
Underlying diseases		
None	27 (58.70)	27 (58.70)
Diabetes mellitus	10 (21.74)	10 (21.74)
Hypertension	4 (8.70)	6 (13.04)
Others	5 (10.87)	3 (6.52)
Cause of injuries		
Scissors	1 (2.17)	2 (4.35)
Glass	3 (6.52)	3 (6.52)
Knife	42 (91.30)	41 (89.13)
Zone of injuries		
I	4 (8.70)	6 (13.04)
II	24 (52.17)	23 (50.00)
III	9 (19.57)	9 (19.57)
IV	5 (10.87)	3 (6.52)
V	4 (8.70)	5 (10.87)
Tendons injuries		
1 tendon	14 (30.43)	13 (28.26)
2 tendons	23 (50.00)	26 (56.52)
>2 tendons	9 (19.57)	7 (15.22)
Complication		
No	45 (97.83)	44 (95.65)
Adhesion	1 (2.17)	2 (4.35)

### Clinical characteristics of patients

In the WALANT group, underlying diseases of patients were diabetes mellitus (21.74%) and hypertension (8.70%). Most causes of injuries were by knife (91.30%). Most injuries were in zone II (52.17%) and 2 tendons (50.00%). The complication was adhesion (2.17%). In the

conventional method group, underlying diseases of patients were diabetes mellitus (21.74%) and hypertension (13.04%). Most causes of injuries were by knife (89.13%). Most injuries were in zone II (50.00%) and 2 tendons (56.52%). The complication was adhesion (4.35%). Data were shown in Table 2.

**Table 2** Clinical characteristics of patients.

Variables	n	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	p-value
Pain score preoperative						
WALANT Technique	46	46.70	2148	1049	-0.74	0.941
Conventional Method	46	46.30	2130			
Pain score intraoperative						
WALANT Technique	46	45.85	2109	1028	-0.287	0.774
Conventional Method	46	47.15	2169			
Blood loss (ml)						
WALANT Technique	46	49.13	2260	937	-1.055	0.291
Conventional Method	46	43.87	2018			
Operative time (minute)						
WALANT Technique	46	51.33	2361	836	-1.760	0.078
Conventional Method	46	41.67	1917			
Overall satisfaction						
WALANT Technique	46	48.50	2231	966	-1.094	0.274
Conventional Method	46	44.50	2047			

U-U statistics; Z- Number of standard deviations from mean; p-value; test for statistical significant; WALANT- Wide Awake Local Anesthesia No Tourniquet

### Comparison of the effectiveness in flexor tendon hand repairs between WALANT technique and conventional method

There was no statistically significant difference between the two groups concerning pain

scores preoperative, pain score intraoperative, blood loss, operative time, and overall patient satisfaction. Data were shown in Table 3.

**Table 3** The effectiveness in flexor tendon hand repairs between WALANT technique and conventional method.

Variables	n	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	p-value
Pain score preoperative						
WALANT Technique	46	46.70	2148	1049	-0.74	0.941
Conventional Method	46	46.30	2130			
Pain score intraoperative						
WALANT Technique	46	45.85	2109	1028	-0.287	0.774
Conventional Method	46	47.15	2169			
Blood loss						
WALANT Technique	46	49.13	2260	937	-1.055	0.291
Conventional Method	46	43.87	2018			
Time of surgery						
WALANT Technique	46	51.33	2361	836	-1.760	0.078
Conventional Method	46	41.67	1917			
Overall satisfaction						
WALANT Technique	46	48.50	2231	966	-1.094	0.274
Conventional Method	46	44.50	2047			

U-U statistics; Z- Number of standard deviations from mean; p-value; test for statistical significant; WALANT- Wide Awake Local Anesthesia No Tourniquet

## Discussion

This RCTs study aimed to compare the effectiveness of flexor tendon hand repairs between the WALANT technique and the conventional method. The results showed that the effectiveness in flexor tendon hand repairs between WALANT technique and conventional method in terms of pain score, total blood loss, duration time of surgery and patient satisfaction was not significantly different. The amount of blood loss during surgery between the two was not significantly different, this result was inconsistent with a previous study by Gunasagaran et al., that reported that the WALANT anesthesia provides less surgical bleeding than local anesthesia tourniquet<sup>(8)</sup>. The study by Ruxasagulwong et al., also reported that the amount of blood loss in the conventional group was significantly higher than WALANT group<sup>(9)</sup>.

This study demonstrates for both groups that there was no difference in the patient satisfaction and pain scores which is in line with previous studies that reported that patients felt well satisfied, safe and patient-friendly with the WALANT technique<sup>(11-14)</sup>. A study of Koegst et al., revealed that Eighty percent of patients were satisfied with the WALANT technique and they felt good after surgery because of no need to avoid and worry about anesthetics with adrenaline side effects<sup>(15)</sup>.

This study also revealed no significant difference in the time of surgery of the two methods. However, the mean time of surgery, 36.80 minutes for the WALANT technique and 39.73 minutes for the conventional method, in our study was slightly higher when compared with 25.52 minutes in previous study of Sasor et al.,<sup>(16)</sup> A study by Lalonde and Martin, reported that the WALANT technique operative time of surgery was lower than the conventional method. All patients were able to do one-day surgery without being admitted to the hospital<sup>(13)</sup>. A study of Orbach et al., reported that the mean time of surgery by the WALANT technique was 30 minutes, no abnormalities, no extra bleeding or other complications and the surgery was performed in the outpatient clinic<sup>(17)</sup>. The WALANT technique was time-saving and cost-effective. Patients felt highly safe and satisfied with shorter time for post-anesthesia care, and no need to admit to the hospital<sup>(11,12,16)</sup>.

In summary, this study shows no statistically significant difference between the two groups concerning pain scores preoperative, pain score intraoperative, blood loss, time of surgery, and overall patient satisfaction. However, the WALANT technique offers a simple and safe alternative to the conventional method and this study revealed the effectiveness in flexor tendon repairs. Hence, the results of this study may have implications for admission policies for surgery patients. Further multi-center studies will be necessary to confirm our

findings in a larger number of patients before giving any serious interventions to Thailand as a whole.

There were some limitations to the present study. First, this study was a single-site study. Secondly, all patients in this study were 18 years of age or over so the sample is not representative of all age groups. Finally, the data of medical costs were not conducted. Future studies should be conducted as a multi-center study, included children as study subjects and medical costs. The strengths of the present study were that it was made up of all new cases of hand injuries, surgery by the orthopedist, interview and data collection by nurses researcher coordinators, large enough number of study subjects, randomization by systematic random sampling technique, and no loss of study subjects to follow-up. This study suggested that orthopedists can choose the WALANT technique as an effective alternative to the conventional method for flexor tendon hand repairs because of several reasons. The WALANT technique is more convenient. It can be performed without preoperative testing and anesthesia consults, no need for intravenous catheter insertion and monitoring during surgery. It has advantages like less blood loss and high patient satisfaction.

## Conclusions

This study revealed that the effectiveness in flexor tendon repairs of the WALANT technique was not different in pain score preoperative and intraoperative, total blood loss, time of surgery, and patients satisfy as the conventional method.

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## Potential conflicts of interest

The authors declare no conflicts of interest.

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**การศึกษาเปรียบเทียบประสิทธิผลการรักษาผู้ป่วยที่ได้รับการผ่าตัดต่อเส้นเอ็นงอนิ้วมือระหว่างวิธีปกติกับวิธี WALANT Technique**

ชินวัฒน์ ศรีใส, พบ, สุรัตน์ เจียรณมงคล, พบ

**วัตถุประสงค์:** เพื่อศึกษาเปรียบเทียบประสิทธิผลการรักษาผู้ป่วยที่ได้รับการผ่าตัดต่อเส้นเอ็นงอนิ้วมือระหว่างวิธีปกติ กับวิธี Wide Awake Local Anesthesia, No Tourniquet (WALANT technique)

**วิธีการศึกษา:** รูปแบบการศึกษาค้นคว้าครั้งนี้เป็นแบบ randomized controlled trials (RCTs) โดยกลุ่มศึกษาเป็นผู้ป่วยที่ได้รับการผ่าตัดต่อเส้นเอ็นงอนิ้วมือ โดยดำเนินการแบ่งผู้ป่วยเป็น 2 กลุ่ม โดยกลุ่มแรกเป็นกลุ่มศึกษาจำนวน 46 ราย ที่ได้รับการผ่าตัดต่อเส้นเอ็นงอนิ้วแบบ WALANT technique และกลุ่มที่ 2 จำนวน 46 รายเป็นกลุ่มควบคุมที่ได้รับการผ่าตัดต่อเส้นเอ็นงอนิ้วโดยวิธีดั้งเดิม โดยทั้ง 2 กลุ่มได้รับการผ่าตัดต่อเส้นเอ็นงอนิ้วที่โรงพยาบาลร้อยเอ็ดระหว่างวันที่ 1 มิถุนายน พ.ศ. 2561 ถึง 31 ธันวาคม พ.ศ. 2562 เก็บข้อมูล pain score การเสียเลือด เวลาในการผ่าตัด และความพึงพอใจของผู้ป่วย สถิติที่ใช้ในการวิเคราะห์ข้อมูลประกอบด้วยสถิติเชิงพรรณนาและสถิติ Mann-Whitney U test

**ผลการศึกษา:** ผลการศึกษาประสิทธิผลของการผ่าตัดต่อเส้นเอ็นงอนิ้วทั้ง 2 วิธีพบว่าไม่มีความแตกต่างกันในคะแนนความเจ็บปวดก่อนผ่าตัด ( $p=0.941$ ) ระหว่างผ่าตัด ( $p=0.774$ ) การสูญเสียเลือด ( $p=0.291$ ) เวลาที่ใช้ในการผ่าตัด ( $p=0.078$ ) และความพึงพอใจของผู้ป่วย ( $p=0.274$ )

**สรุปผลการศึกษา:** ผลการศึกษาค้นคว้าครั้งนี้แสดงให้เห็นว่าประสิทธิผลของการผ่าตัดต่อเส้นเอ็นงอนิ้วแบบ WALANT technique และวิธีดั้งเดิมไม่แตกต่างกันทั้งในด้านความเจ็บปวดของผู้ป่วยก่อนผ่าตัด ระหว่างผ่าตัด การสูญเสียเลือดระหว่างผ่าตัด ระยะเวลาในการผ่าตัด และความพึงพอใจของผู้ป่วย

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