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Comparison between Functional Outcomes of Flexor Tendon Repair Under Wide-Awake Local Anaesthesia No Tourniquet and Brachial Plexus Block

MOSTAFA MAMDOH HAREDY, M.D.; AHMED SALAH AHMED MAZEED, M.D.;
OMAR MUHAMMED HUSSEIN, M.B.B.Ch and AHMED GABER ABD EL MEGEED, M.D.

The Department of Plastic Surgery, Faculty of Medicine, Sohag University

Abstract

Background: Flexor tendon injuries have long been a significant challenge in hand surgery, with an incidence of approximately 4.83 per 100,000 people. However, debates persist regarding the optimal repair techniques and rehabilitation approaches.

Objective: This study aims to gather additional data on the functional outcomes of flexor tendon repair performed under Wide-Awake Local Anesthesia No Tourniquet (WALANT) compared to Brachial Plexus Block (BPB).

Patients and Methods: All patients who underwent a primary flexor tendon repair had a tendon injury in zone I or II. A total of 30 flexor tendon repairs were done which meet the inclusion criteria. Simple randomization was used that odd numbered patients were operated with WALANT and even numbered patients with BPB.

Results: A total of thirty flexor tendon repairs in zone I or II were included in the final evaluation. This group comprised 20 males and 10 females, with an average age of 28 years (SD: 8) and a mean follow-up of 6 months. Age was insignificantly different between the two groups. There was significantly higher mean operative time in group II (BPB) compared to group I (WALANT) (p = <.001). The Pain of Procedure by the mean VAS score was insignificantly different between the two studied groups (p = 0.5) There were insignificant differences between the two studied groups as regard the mean DASH score (p = 0.1).

Conclusions: The Wide-Awake Local Anesthesia No Tourniquet (WALANT) technique is an effective approach for flexor tendon repair in Zone II, yielding comparable functional outcomes and complication rates to Brachial Plexus Block (BPB). Additionally, WALANT offers significant benefits, including shorter operative time, fewer anesthesia-related delays, and reduced postoperative pain, leading to decreased analgesic use.

Correspondence to: Dr. Omar Muhammed Hussein,
E-Mail: omaraboeldahab9@icloud.com

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Introduction

Flexor tendon injuries have long been a significant challenge in hand surgery, with an incidence of approximately 4.83 per 100,000 individuals. However, debates persist regarding the optimal repair techniques and rehabilitation approaches **[1]**.

Postoperative stiffness remains a difficult complication following flexor tendon injuries, prompting surgeons to explore more effective repair techniques. Enhancing repair strength can be achieved by incorporating core sutures at the repair site and addition of epitendinous sutures. Additionally, the use of wide-awake local anesthesia with no tourniquet (WALANT) has gained popularity in flexor tendon repair, as it allows for real-time assessment of repair strength through active motion during surgery. This approach has been beneficial in minimizing tendon bunching through pulleys and reducing tendon gapping **[1]**.

Our study aim is to collect more date regarding the outcomes of flexor tendon repair surgery using WALANT versus Brachial Plexus Block (BPB).

Patients and Methods

This study was approved by the Medical Research Ethics Committee of the Faculty of Medicine, Sohag University. All patients were fully informed about the study's purpose, objectives, and potential risks. Written informed consent was obtained, and their data remained strictly confidential. Primary flexor tendon repair was performed on all patients with tendon injuries in zone I or II.

Exclusion criteria: Included patients younger than 16 or older than 65, those with bone fractures, or individuals with complex or multisystem injuries. All procedures were carried out at Sohag University Hospital by one surgeon trained through our internship program. A total of 30 flexor tendon repairs meeting the inclusion criteria were performed. Simple randomization was applied, with odd-numbered patients undergoing surgery with WALANT and even-numbered patients with BPB.

Medical records were examined to gather information on patient demographics, range of motion, hand grip strength, and any complications encountered. Subsequently, operative reports were analyzed to categorize the patients into two distinct groups: the 1st tendon repair done under WALANT and the 2nd under BPB.

The surgical repair and postoperative rehabilitation protocol were the same for both groups. Tendon repair involved a core suture using 3-0 or 4-0 monofilament absorbable PDS, along with an epitendinous suture using 6-0 monofilament non-absorbable Proline. An early rehabilitation program with active motion was introduced for all 30 patients. The final clinical evaluation assessed key outcome measures, including operation time, Visual Analog Scale (VAS) pain scores, hand grip strength, range of motion (ROM) using the Strickland score, Quick Disabilities of the Arm, Shoulder, and Hand (DASH) scores, and complications such as tendon rupture, infection, and stiffness.

Statistical analysis was conducted using SPSS v26 (IBM, Chicago, IL, USA). Normality was assessed via the Shapiro-Wilk test and histograms. Parametric data were presented as mean ± SD and compared using an unpaired Student's *t*-test. Qualitative data were shown as percentages and analyzed with the Chi-square test. A two-tailed $p<0.05$ was considered significant.

Results

A total of thirty tendon repairs in zone I or II were concluded in the final evaluation. This group comprised 20 males and 10 females, with an average age of 28 years (SD: 8) and a mean follow-up of 6 months. Fifteen patients were in the WALANT group and 15 in the BPB group. Age was insignificantly different between the two groups. Male gender was significantly higher in BPB group than WALANT group (p-value <0.001). Job was significantly different between the two groups (p-value = 0.002) (Table 1).

Table (1): Demographic data of the studied groups.

	WALANT	BPB	p-value
Age (Years):			
Mean (± SD)	28.27 (±9.79)	27.93 (±6.6)	0.914
Range	19-44	19-36	
Gender:			
Male	5 (33.33%)	15 (100%)	<0.001*
Female	10 (66.67%)	0 (0%)	

*: Significant as p-value <0.05.

There was significantly higher mean operative time in group II (BPB) compared to group I (WALANT) ($p = <.001$) (Table 2). The Pain of Procedure (the mean VAS score) was insignificantly different between the two studied groups ($p = 0.5$) (Table 3).

Table (2): Operation time in study groups.

	Mean (± SD)	Minimum	Maximum	p-value
Operation Time:				
WALANT	36.5 (±4.74)	30	40	<0.001
BPB	53.5 (±5.8)	40	60	

Table (3): Pain of procedure (VAS) of the studied groups.

	Mean (± SD)	Minimum	Maximum	p-value
VAS:				
WALANT	3.1 (±1.29)	2	6	0.5
BPB	2.7 (±1.16)	2	5	

Four complications (2 wound infections, tendon rupture and Stiffness) were observed in group I (WALANT) (Table 4). Grip strength percentage was assessed by calculating the ratio of grip strength on the injured side to that on the non-injured side and was similar between the two groups ($p = .0.07$) (Table 5). No statistical differences found between the two groups in range of motion (ROM) by Strickland score ($p = 0.3$) (Table 6). There were insignificant differences between the two studied groups as regard the mean DASH score. ($p = 0.1$) (Table 7).

Table (4): Complications of the studied groups.

Complications	WALANT	BPB	*p*-value
Early:			
NO	11 (73.33%)	15 (100%)	0.2
Wound infection	2 (13.33%)	0 (0%)	
Late:			
Tendon rupture	1 (6.67%)	0 (0%)	
Stiffness	1 (6.67%)	0 (0%)	

Table (5): The hand grip strength percent.

	Mean (±SD)	Mini-mum	Max-imum	*p*-value
Hand Grip Strength % (Injured/Normal):				
WALANT	73% (±9.08)	55%	82%	0.07
BPB	70.3% (±8.76)	57%	79%	

Table (6): Range of motion by Strickland score of the studied groups.

	WALANT	BPB	*p*-value
Strickland Score:			
Excellent	8 (53.33%)	8 (53.33%)	0.3
Good	3 (20%)	7 (46.67%)	
Fair	4 (26.67%)	0 (0%)	

Table (7): The DASH score.

	Number of cases	Mean (±Sd)	Minimum	Maximum	*p*-value
Dash Score:					
WALANT:	12	8 (±2.93)	3	13	0.1
No-Minimal Disability	3	41 (±4.24)	38	44	
Partial Disability					
BPB:	8	6.2 (±2.28)	4	9	
No-Minimal Disability	7	38.8 (±6.06)	30	45	
Partial Disability					

Cases

Case 1 *(WALANT group):*

- Male patient 22 years old.
- Complete cut of FDS and FDP tendons of right index finger in Zone II.
- The wound was extended with Brunner incisions. Both digital nerves were not injured. There was a breach of the flexor sheath at A2 pulley. A2 pulley was vented 50%.
- The FDP and FDS tendons were repaired with a 4-strand core suture using 4/0 PDS, and a running 6/0 epitenon stitch.
- Active movement test was done Intraoperatively before skin closure.

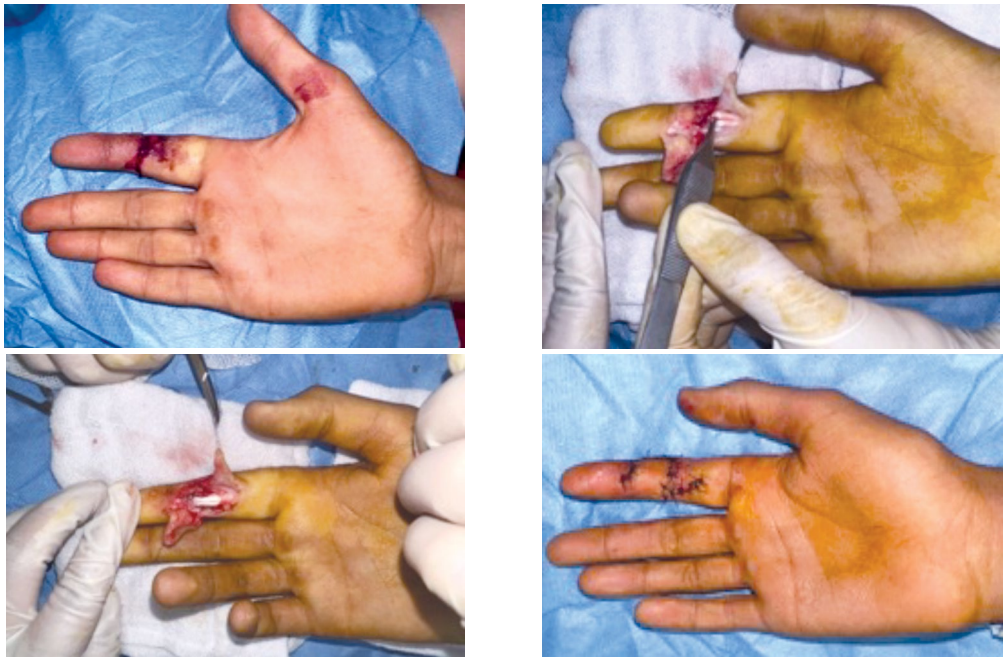

Fig. (1-A): Case 1 (intraoperative photographs).

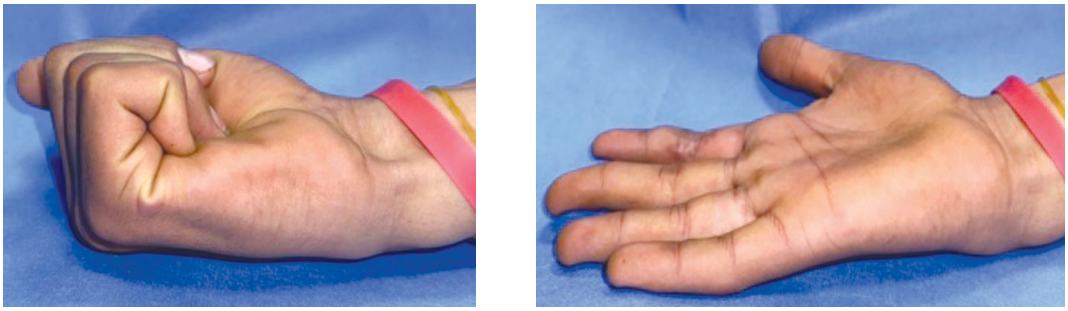

Fig. (1-B): Case 1 full flexion and extension.

Case 2 *(BPB group):*

- Male patient 32 years old.
- Complete cut of FDS and FDP tendons of right middle finger in Zone II.
- Brachial plexus block (BPB) was taken before surgery and torniquet was applied.
- The wound was extended with Brunner incisions. Both digital nerves were not injured.
- The FDS and the FDP tendons were repaired with a 4-strand core suture using 4/0 PDS, and a running 6/0 epitenon stitch.

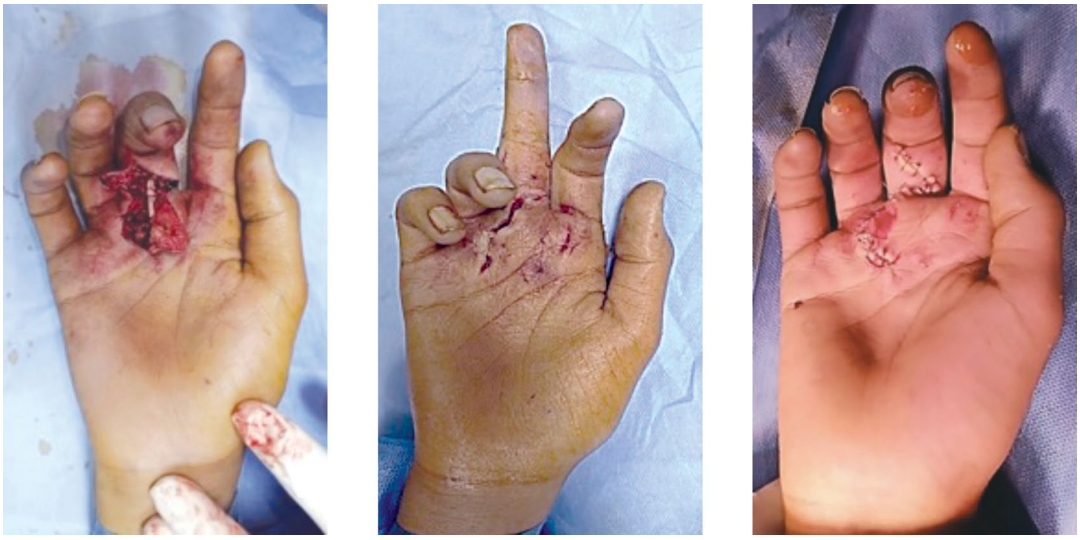

Fig. (2-A): Case 2 (intraoperative photographs).

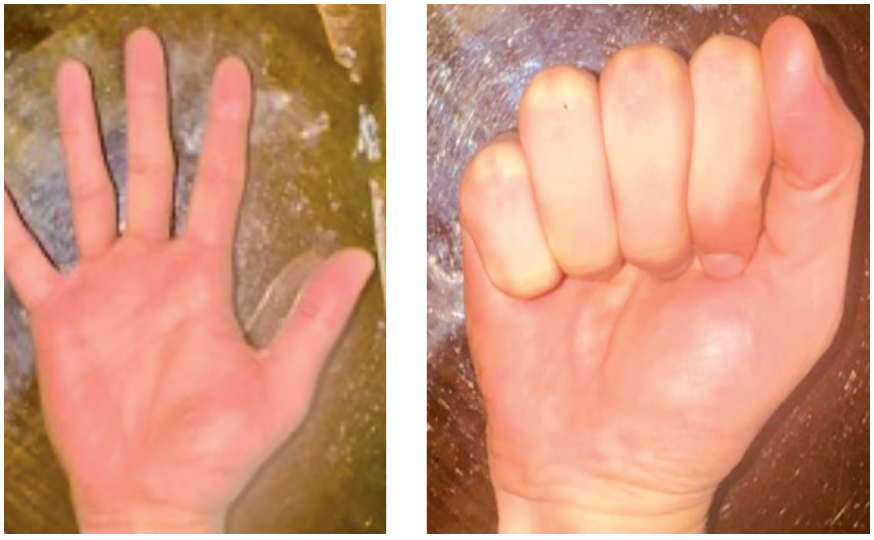

Fig. (2-B): Case 2 full flexion and extension (3 months postoperative).

Discussion

Our study aimed to compare the outcomes of Wide-Awake Local Anaesthesia No Tourniquet (WALANT) and Brachial Plexus Block (BPB) in flexor tendon repair surgeries performed in zone I or II. A total of 30 cases were included, evenly divided into two groups of 15 patients each Group I received WALANT, while Group II underwent BPB.

The findings revealed a significantly shorter operative time in the WALANT group compared to the BPB group ($p<0.001$). The duration from the initial incision to complete skin closure ranged between 30 to 40 minutes, with an average of 36.5 minutes.

Multiple studies have indicated that flexor tendon repair performed under Wide Awake Local Anesthesia No Tourniquet (WALANT) is typically quicker than when using traditional anesthesia (TA). A recent study by Bamal et al., compared the outcomes of flexor tendon repair under WALANT and TA, revealing that the WALANT group experienced shorter overall operative times due to reduced preparation and anesthesia-related delays **[2]**.

In the current study, it was found that the pain of procedure using visual analogue scale (VAS) was insignificantly different between the two groups (p-value=0.5) with slightly higher scores in group I.

This was in consistent with Abdelhameed et al. **[3]** who performed flexor tendon repair under WALANT and reported low VAS scores **[4]**.

Our findings align with those of Lee et al., who compared the WALANT technique to conscious sedation for hand surgeries using the VAS score. Their study revealed a significant advantage for the WALANT group within the first 24 hours, with the most notable difference occurring at the six-hour mark post-surgery. Additionally, patients in the WALANT group required fewer analgesic prescriptions during the subsequent 24 hours **[5]**.

In the current study, it was found that there was insignificant deference in postoperative complications between the two groups (infection, tendon rupture, stiffness) (p-value=0.2).

These results weren't in agreement with Townsend et al., who conducted a previous comparative study of (WALANT) Versus Traditional Anesthesia on 65 patients and reported no difference could be significant in tendon rupture rates between the groups, however the study reported more infection rates in the WALANT group **[6]**.

Higgins et al., conducted a large retrospective study over 10 years involving 102 patients who underwent flexor tendon repair using WALANT. The study reported a rupture rate of approximately 3.3% (4 out of 122 tendons). Additionally, intraoperative testing identified tendon gapping or bunching in seven patients, which was corrected during surgery, and none of these cases experienced a subsequent rupture **[7]**.

In the current study, it was found that there were insignificant differences between group I and II as regard grip strength (p-value=0.07). This was in agreement with Townsend et al., who compared 65 flexor tendon repairs (zones I and II) using WALANT vs traditional anaesthesia, and there was no significant difference in grip strength between the two groups **[6]**.

In the current study ROM (range of motion) after 6 weeks was insignificantly different between the two groups using Strickland score (excellent, good and fair) (p-value=0.3).

The number of patients with excellent and good scores in our study was comparable to the numbers by Starnes et al., study **[8]**.

A previous study by Pan et al., used updated protocols for flexor tendon repair and achieved 87% good or excellent ROM scores **[9]**.

In the current study, there was insignificant differences between the two studied groups as regard the DASH score which assess the presence of any functional disability 3 months postoperatively (p-value=0.1).

Townsend et al. and Bamal et al., both investigated functional outcomes following flexor tendon repairs, specifically analysing DASH scores. Townsend's study, which included 65 zone I and II repairs, found no significant difference in DASH scores between the WALANT and traditional anaesthesia groups. However, the WALANT group benefited from intraoperative active motion testing, which may have enhanced repair quality. Similarly, Bamal's study indicated positive trends for WALANT, showing advantages in early mobility and lower intraoperative pain, though the differences in DASH scores were not statistically significant **[2,6]**.

Limitations of this study:

This study has some limitations: First, it was conducted at a single institution, which restricts the generalizability of the results. Conducting multi-center studies would enhance external validity by incorporating a more diverse patient population.

Second, although the study was randomized and controlled, there was no mention of blinding for the type of anesthesia used. This lack of blinding could introduce bias, especially in subjective assessments such as pain scores (VAS) and functional evaluations.

Third, certain outcome measures, including pain (VAS) and functional scores (DASH), are inherently subjective and influenced by individual perception, potentially impacting result consistency.

Given these limitations, further research with larger, more diverse samples and improved control of variables is necessary to validate and expand on these findings.

Conclusion:

Wide-Awake Local Anesthesia No Tourniquet (WALANT) is a valid method for flexor tendon repair in Zone II and provides similar functional outcomes and complication rates compared to Brachial Plexus Block (BPB), and offers several advantages. These include significantly reduced operative time, fewer anaesthesia-related delays, and lower postoperative pain, with patients requiring less analgesics.

The results suggest that WALANT is a suitable alternative to BPB, as it allows for intraoperative motion testing, which may help in reducing functional complications. While both methods showed similar outcomes in terms of range of motion, grip strength, and functional scores (such as DASH), WALANT demonstrates operational efficiency and reduced operative time.

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