Wide Awake Local Anesthesia no Tourniquet (WALANT) Surgery for Tendon Repair in Hand Trauma

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ABSTRACT

Objective: To compare the functional outcomes in terms of active range of motion for tendon repair surgeries under wide-awake local anaesthesia versus general anaesthesia.

Study design: Comparative prospective study.

Place and Duration of Study: Department of Plastic & Reconstructive Surgery, Dr Ruth K.M. Pfau Civil Hospital Karachi Pakistan, from Jan to Sep 2020.

Methodology: Patients of either gender of age 15 years or above with hand injuries with tendon repair required, operated within the hospital premises were included in the study using the non-probability consecutive sampling technique. Individuals who were operated on under wide-awake local anaesthesia were taken as approach arms (n=65). While the patients undergoing tendon repair under general anaesthesia were considered as the study's control arm (n=65). The final functional outcomes were assessed in the sixth week of the surgery by calculating the total active range of motion.

Results: For the range of motion of the injured finger in the general anaesthesia group, 25 (38.5%) had excellent outcomes, 14 (21.5%) had a good outcome, and 8 (12.3%) had fair outcomes, while in the WALANT group, 30 (46.2%) had excellent outcome, 16 (24.6%) had a good outcome and 12 (18.5%) had a fair outcome. There was no relationship between the range of motion of the injured finger and the group (p=0.101).

Conclusion: The functional outcomes in active range of motion are better in the WALANT approach than in general anaesthesia.

Keywords: Functional outcomes, General anaesthesia, Hand injury, Injured finger, Range of motion, Tendon repair, WALANT approach.

How to Cite This Article: *Kiran S, Khan AAF, Ali H, Farhina M, Gulzar S, Rashid S. Wide Awake Local Anesthesia no Tourniquet (WALANT) Surgery for Tendon Repair in Hand Trauma. Pak Armed Forces Med J 2022; 72(3): 966-970. DOI: https://doi.org/10.51253/pafmj.v72i3.5708*

INTRODUCTION

Hand injuries are the most commonly occurring injury of the body and comprise 6.6% to 28.6% of all the injuries and 28% of the musculoskeletal injuries.[1,2] One-fifth of the emergencies at the hospital comprised of hand injuries.[3] Most frequent mechanisms of hand injuries are crush injury, road traffic accidents, contusions and assaults.[1-3] In most cases, the dominant hand is affected, which may cause substantial psychological stress and physical disability.[4] These injuries may also be an economic burden for society due to the high cost of healthcare and a long time off from work.[5]

Technically, hand surgery is in high demand, particularly which involves the tendons and bones. The outcomes are directly associated with technical precision. The primary problem of tendon surgery is the post-procedure rupture and adhesions. The reconstruction or repair of flexor or extensor tendons in hand should be firm enough for early mobilization and less bulky and clean for interrupted gliding of the reconstructed/repaired tendon. Before the wound closure, ideally, one would like to evaluate both the precision and strength of the tendon repair. Administration of anaesthesia before the tendon repair is necessary, which keeps the extrinsic forearm muscles unparalyzed and an alert and the active patient who can respond to the surgeon's command at an appropriate time during the procedure.[6]

Due to these requirements, most hand surgeons are switching from conventional surgery that uses a tourniquet and sedation to wide-awake local anaesthesia (WALANT) approach without using a tourniquet, and many benefits are associated with the WALANT approach as compared to the conventional treatment approach.[7] Patient convenience and comfort are increased due to no tourniquet and sedation. A wide range of surgical corrections from bone, and joints to nerves and tendons performed under wide-awake local anaesthesia technique no tourniquet (WALANT) provide reduced use of sedatives, lower cost to the patient, more efficient workflow in the

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Received: 20 Nov 2020; revision received: 20 Feb 2021; accepted: 23 Feb 2021

operating room, simpler surgical draping reduced operating time, elimination of the need for conventional postoperative recovery.[8,9] Additional benefits for tendon repair surgeries include intraoperative communication with the patient and active participation in assessing the adequacy of repair, the maximum range of motion achievement and rehabilitation from the start.[7] The WALANT technique allows active movement during surgery which enables the surgeon to identify repair gapping of the tendon in the site repair and make corrections accordingly before the closure of skin, decreasing the complications that usually occur with the conventional approach.[6]

In Pakistan, the prevalence of hand injury is estimated at 13.6%.[10] Presently, to the best of our knowledge, there is inadequate literature available on the WALANT technique in Pakistan, so that this study will increase the evidence on the reliability of the WALANT technique. The objective of the study was to compare the functional outcomes in terms of active range of motion for tendon repair surgeries under wide-awake local anaesthesia versus general anaesthesia.

METHODOLOGY

It was prospective comparative study conducted at the Department of Plastic & Reconstructive Surgery, Dr Ruth K.M. Pfau Civil Hospital Karachi Pakistan, from January to September 2020. The open epi sample size calculator was used for calculation by taking statistics of range of motion as 13.33 ± 4.16 in the WALANT group,[11] and considering a 20% difference in range of motion as 15.99 ± 4.99 in the conventional group, power of test 80% and 95% confidence level, the estimated sample size was 26 in each group. However, we included 65 patients in each group to increase the results' adequacy.

Inclusion Criteria: Patients of either gender, of age 15 years or above with hand injuries with tendon repair required, operated within the hospital premises were included in the study.

Exclusion Criteria: Patients allergic to agents of local anaesthesia, patients with anxiety symptoms, mental disorders rendering them unable to comprehend and follow intra-operative commands, associated nerve injuries, patients requiring bone fixation or with other complex injuries and with soft tissue loss requiring coverage and patients with massive contamination, crush injuries or infection which needs to be addressed and treated prior to definitive were excluded from the study.

The study was commenced after acquiring approval from Hospital Ethics Committee (Ref: IRB-1316/DUHS/Approval/2020/03). Patients meeting the inclusion criteria were recruited into the study after taking written informed consent. The purpose of the study and the possible risk of the procedure were explained to the study participants. All of the information related to the patients was kept confidential, and only the principal investigator had access to data related to patient identification.

Patients were randomly allocated into two groups, i.e., general anaesthesia and wide-awake local anaesthesia (WALANT) approach arm, using a random number. Before surgery, patients were assessed by a duty doctor to monitor baseline indicators for surgery. Patients were advised to visit the outpatient department for follow-up. The final functional outcomes were assessed in the sixth week of the surgery by calculating the total active range of motion. Total active range motion (TAM) scores were calculated according to the criteria given by the Strickland method. The American Society for Surgery of the Hand (ASSH) and a goniometer were used to measure the range of motion (Table-I).

Table-I: Strickland method and the american society for surgery of the hand (ASSH) TAM scoring criteria.

Strickland Score	
Score Classification	Strickland %
Excellent	85 - 100
Good	70 - 84
Fair	50 - 69
Poor	<50
American Society for Surgery of the Hand TAM Score	
Score Classification	%Total Active Range Motion = TAM of Injured Finger/Total Active Range Motion of Contralateral Finger
Excellent	100
Good	75 - 99
Fair	50 - 74
Poor	<50
Worse	<Pre-Operative

Strickland Score was computed by using the below formula.[12]

$$\text{Strickland} = \frac{(\text{Active Flexion PIP + DIP}) - (\text{Extension Deficit PIP + DIP}) \times 100\%}{175}$$

ASSH TAM scores were obtained by taking the difference between the sum of active flexion measured

at DIP, PIP and MCP and the sum of extension deficit of these three joints, as shown below.[12]

TAM=Total active flexion [at distal interpha-langeal (DIP), proximal interphalangeal (PIP) and meta-carpophalangeal (MCP)]-total extension deficit (at DIP, PIP and MCP). Classification of TAM was made according to the below table. In addition, the TAM of the contralateral finger was also computed to obtain percentages of the score by dividing the TAM of the injured finger by the TAM of the contralateral finger.

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Quantitative variables were summarized as mean ± SD and qualitative variables were summarized as frequency and percentages. An independent t-test was used to compare the Strickland score and ASSH TAM score between both groups. Fisher-exact was applied to assess the association between functional outcome and groups. The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

One thirty subjects were included in the trial. The mean age was 29.45 ± 7.57 years (Range: 15 to 82 years). Of 130 subjects, 74.6% were males, and 25.4% were females. Most patients had a right-hand injury (n=120, 92.3%), and ten subjects had a left-hand injury (7.7%). About 72.3% of the subjects were employed, and 27.7% were unemployed. Almost 69.2% had an injury due to a glass cut, 26.9% had an injury due to a sharp cut, 3.1% had an injury due to a knife cut, and only one subject had an injury due to a machine cut (0.8%). Group-wise characteristics were displayed in Table-II.

Most patients had injuries to the Zone II flexor tendon (25%), followed by the Zone III flexor tendon (20%) (Figure).

Table-II: Baseline characteristics of study subjects.

Variables	General Anesthesia	Walant Group
	Mean ± SD / n (%)	Mean ± SD / n (%)
Age (years)	28.39 ± 9.54	28.51 ± 5.01
Gender		
Male	46 (70.8%)	51 (78.5%)
Female	19 (29.2%)	14 (21.5%)
Side of Hand		
Left	4 (6.2%)	6 (9.2%)
Right	61 (93.8%)	59 (90.8%)
Occupation		
Employed	43 (66.2%)	51 (78.5%)
Unemployed	22 (33.8%)	14 (21.5%)
Mechanism of Injury		
Glass cut	47 (72.3%)	43 (66.2%)
Knife cut	2 (3.1%)	2 (3.1%)
Machine cut	-	1 (1.5%)
Sharp cut	-	10 (29.2%)

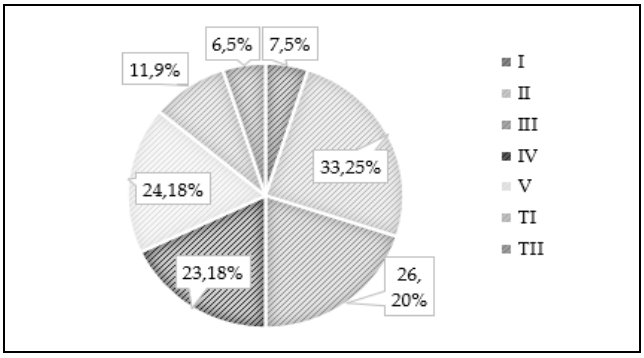

Figure: Frequency distribution of zones of flexor tendon injury.

The Strickland score and ASSH TAM score were significantly higher in the WALANT group as compared to the conventional group (*p* ≤0.05) (Table-III).

For ROM of an injured finger in the general anaesthesia group, 25 (38.5%) had an excellent outcome, 14 (21.5%) had a good outcome, and 8 (12.3%) had a fair outcome. In contrast, in the WALANT group, 30 (46.2%) had excellent outcomes, 16 (24.6%)

Table-III: Comparison of strickland score and american society for surgery of the hand tam score between both groups.

Groups	Strickland Score	American Society for Surgery of the Hand TAM Score	*p*-value
	Mean ± SD	Mean ± SD	
General Anesthesia	66.25 ± 32.59	66.88 ± 24.58	0.034
Wide Awake Local Anesthesia No Tourniquet (Walant) Approach	77.08 ± 24.48	75.06 ± 19.61	0.038

Table-IV: Comparison of functional outcomes between both groups.

Range of Motion of Injured Finger at Sixth Week (Outcomes)	Groups		*p*-value
	General Anesthesia	Wide Awake Local Anesthesia No Tourniquet (WALANT) approach	
Poor	18 (27.7%)	7 (10.8%)	0.101
Fair	8 (12.3%)	12 (18.5%)	
Good	14 (21.5%)	16 (24.6%)	
Excellent	25 (38.5%)	30 (46.2%)	

had a good outcome, and 12 (18.5%) had a fair outcome. Fisher exact test was applied to assess the relationship between ROM of injured finger and group, which showed no statistical association (p=0.101) (Table-IV).

DISCUSSION

The WALANT approach has been utilized in various surgeries on hands, especially in soft tissue reconstruction or repair.[13] Furthermore, the fractures of the finger can also be managed by percutaneous pinning and relative reduction under the WALANT approach.[14] While general anaesthesia for hand surgery includes a subject with a block, disabled to do motor function in the arm, and with the subject either sedated or intubated, unable to follow the surgeon's instructions during the procedure.[15,16] Hence in the present research, we have assessed the difference in functional outcomes regarding the range of motion in the WALANT group versus general anaesthesia for tendon repair surgeries.

The present study's overall results were good to excellent according to the Strickland method and the American Society for Surgery of the Hand (ASSH) among most patients. Further, the functional outcomes in the WALANT group (good to excellent) were better than in the general anaesthesia group. Using the WALANT technique provides an optimal opportunity for intra-operative total active movement (ITAM), making surgeons even more comfortable starting early mobilization.[13,17]

In the present study in the WALANT group, the mean TAM score according to Strickland criteria was estimated as 77.08 ± 24.48. In contrast, the mean TAM score according to ASSH criteria was 75.06 ± 19.61 in the WALANT group at the sixth postoperative week. This showed that the total recovery of ROM was superior in WALANT compared to the general anaesthesia group. A study by Na *et al,*[18] also found a 94% recovery rate for ROM using the WALANT technique. Further, the mean score of TAM for the thumb finger was 68.33 in the sixth week, which significantly increased to 73.33 in the 12th week. Huang *et al,*[13] in their study, treated sixty subjects with distal radius fractures and 40% of them were treated either by a dorsal or volar plate under the WALANT technique. The study revealed a mean Quick DASH score of 7.60 and mean wrist flexion and extension of 69.6° and 57.4°, respectively, at one-year follow-up. This showed that patients could have better ROM of the injured hand through the WALANT technique. In a Pakistani study by Tahir *et al,*[11] forty patients with distal radial fracture were enrolled, and the WALANT technique was utilized for fixation. The study showed that most of the patients had good outcomes. The mean quick DASH score was estimated as 13.3, whereas the mean Mayo score was 81.6. However, in the final review, the mean extension and flexion range were 53 and 64 compared to the opposite hand. Hence, the WALANT approach seems safe and acceptable for fixation of the tendon.

CONCLUSION

The study concluded that the functional outcomes of active range of motion are better for the WALANT approach than general anaesthesia.

Conflict of Interest: None.

Author's Contribution

SK: Concieved idea, manuscript writing, accountable for the accuracy and integrity of the study, FAAK: Proof reading, statistical analysis, HA: Literature searching, contribution in manuscript writing, MF: Data collectoin, analysis, SG: Data collection and critical review, SR; References writing and critical review.

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