RESEARCH ARTICLE

Use of the wide-awake local anaesthetic no tourniquet in the management of distal radius fractures

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Abstract

Objective: To evaluate the Wide-Awake Local Anaesthesia with No Tourniquet (WALANT) method in fixation of distal radial fractures

Methods: Forty patients admitted to the Jinnah Postgraduate Medical Centre, Karachi, Pakistan were recruited from March 2017 to December 2018. All patients had a distal radial fracture which was appropriate for internal fixation with a locked volar distal radial plate. The surgical site was infiltrated to achieve tumescent local anaesthesia using a solution of 0.9% normal saline and 1% lidocaine with 1:1,000,000 epinephrine. The patients were followed up until fracture union and were evaluated clinically, with goniometry, radiologically and with standard outcome scores (Mayo and qDASH).

Results: The patients were marginally more male than female (55% versus 45%), and mostly the dominant hand was injured (65%). The mean time to union was just over 3 months (15.2 weeks). All were united by 11 months. Good outcomes were achieved at final review with mean qDASH and Mayo scores of 13.3 and 81.6 respectively. The mean flexion and extension range at finalreview was 64 and 53 degrees respectively, and the mean grip strength was 73% when compared with the opposite side.

Conclusion: The WALANT technique seems to be an acceptable and safe technique for fixation of distal radial fractures. There seem to be added benefits in terms of costs, reduced disposables, and intra-operative assessment of active movement.

Keywords: Distal Radius Fractures, Wide Awake, Anaesthesia, Tourniquet, Wide Awake Local Anaesthesia with No Tourniquet, WALANT, adrenaline, Colles' fracture. (JPMA 70: S-42 (Suppl. 1); 2020)

Introduction

Fractures of the distal radius are one of the most commonly encountered injuries in orthopaedic emergencies.[1] These fractures occur mostly due to a fall on an outstretched hand in the elderly population due to poor bone quality and secondary to high-velocity trauma in young adults.[2,3] Treatment options can be either conservative management by casting or surgical fixation. Traditionally, surgical fixation of the distal radius fractures requires open reduction and internal fixation with plating, which is carried out either in general anaesthesia or in regional blocks, such as Bier's block along with the application of a tourniquet to provide a bloodless field.[4]

The treatment of distal radius fractures is continuously evolving. Recently, Lalonde et al.; introduced the concept of Wide Awake Local Anaesthesia with No Tourniquet (WALANT) in elective hand and wrist surgery.[5-8] WALANT is delivered with locally infiltrated lidocaine augmented with epinephrine, with no application of tourniquet during the surgical procedure.[9] The primary advantage of this technique is that the patientis not sedated, and WALANT is, therefore, useful for patients otherwise unfit for anaesthesia. Secondly, patients feel more comfortable as no tourniquet is applied.

Furthermore, patient satisfaction is high because preoperative testing and hospital admission are not required.[1] WALANT reduces the total procedure time because patients are not sedated. The postoperative recovery is enhanced.[10] It is a cost-effective method and facilitates procedures about the hand and wrist as day care procedures.[11,12]

The purpose of this study was to evaluate the WALANT technique in open reduction and internal fixation of distal radius fractures.

Methods

Forty patients were enrolled in the study, between March 2017 and December 2018. The patients that were included had closed fractures or presented within 10 days of the initial injury. Patients with displaced distal radius fractures after failed attempts at closed manipulation and reduction were also included in the study.

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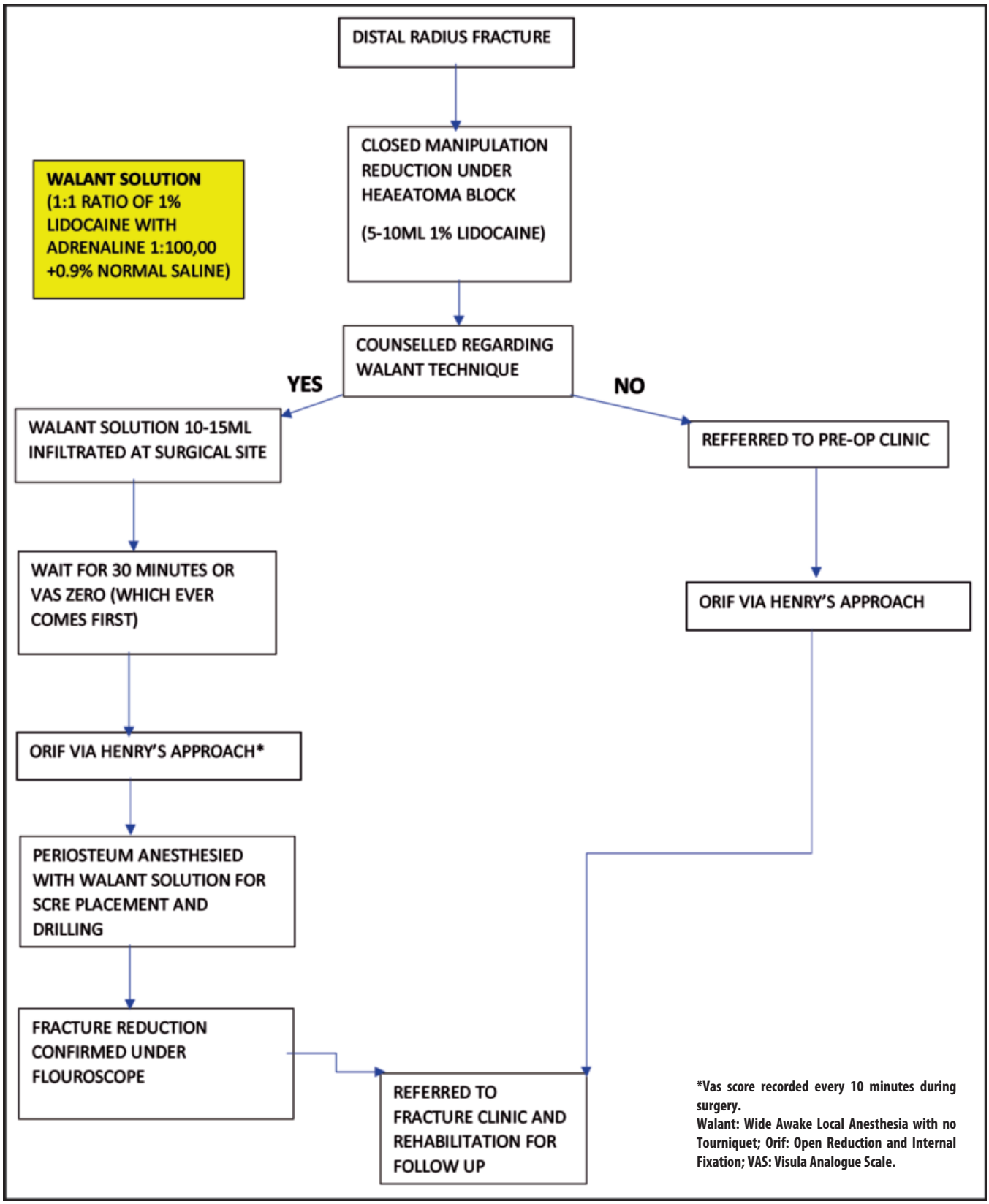

Figure-1: Wide-awake anaesthesia with no tourniquet for distal radius fractures.

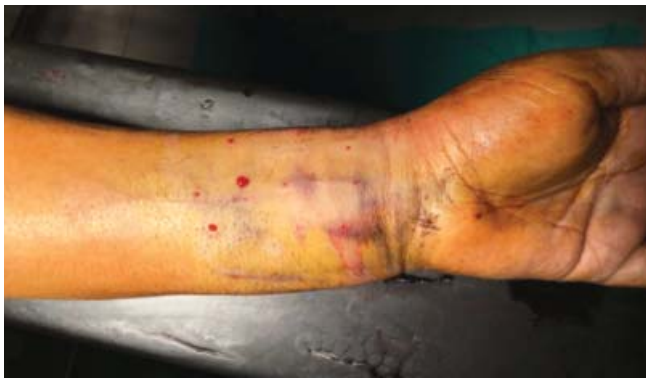

Figure-2a: Pre-operative picture after injecting wide-awake anaesthesia with no tourniquet (walant) solution.

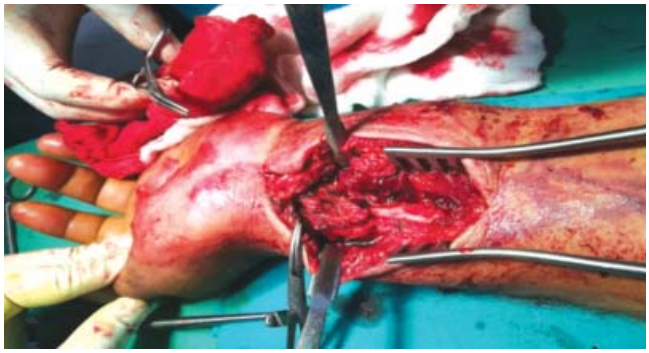

Figure-2b: Intraoperative fracture reduction of distal radius.

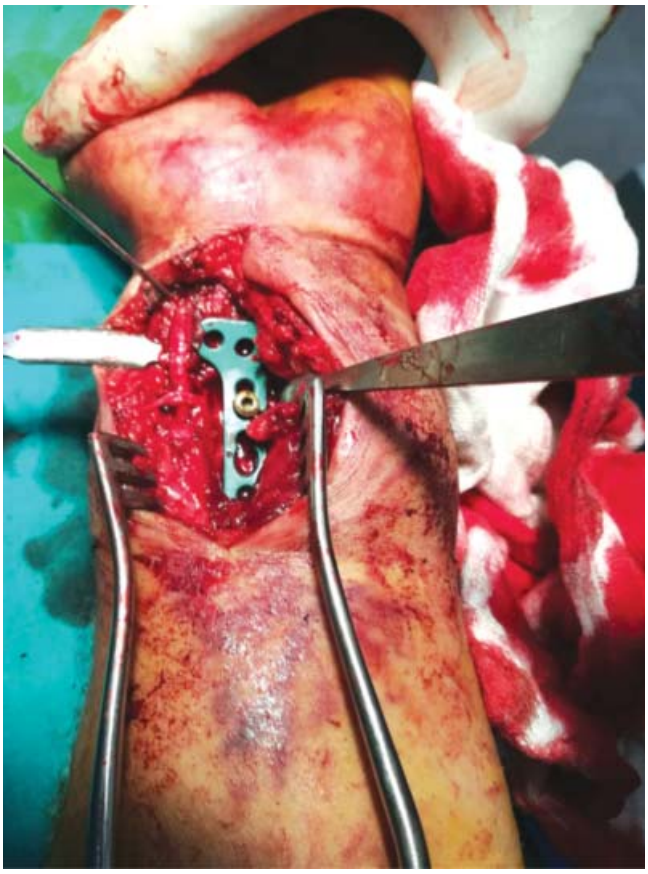

Figure-2c: Plate placement.

Excluded were anxious and non-cooperative patients and those not consenting to the surgery or WALANT. Also excluded were patients with open fractures, malunited fractures of the distal radius and polytrauma patients requiring general anaesthesia or spinal anaesthesia for other injuries, such as long bone fractures and traumatic brain injuries. Patients with peripheral vascular disease, pre-existing cardiac conditions, a bleeding tendency, abnormal clotting profile, hypersensitivity to lidocaine, and skin infection were also excluded.

Wrist radiographs, anteroposterior and lateral view were obtained on the first presentation to the orthopaedic emergency department. The Orthopaedic Trauma Association (OTA) fracture classification system was used to record the fracture pattern.[13]

Before surgery, patients were informed about the WALANT procedure and other anaesthesia options, and the risks and benefits of each treatment option were discussed in detail. Explicitly, we stressed the possibility of the need to convert to general anaesthesia and application of a tourniquet. The patients were warned about the risk of the vasoconstrictive effect of epinephrine concerning digital ischaemia. Written consent for WALANT was taken before surgery, and the study protocol was approved by the Institutional Review Committee of the hospital.

A haematoma block of 3-5 ml 1% plain lidocaine was initially injected through the dorsal aspect of the fracture to allow an initial reduction in the emergency bay, and then patients were transferred to the emergency operating theatre. Figure-1 shows the algorithmic approach to WALANT surgery in our department.

The surface anatomy of Flexor Carpi Radialis (FCR) tendon was identified by radially deviating the wrist and points were marked on the skin. In the same manner, the distal third of the radius was palpated, and four skin points were marked from about 15 cm proximal to the wrist crease and distal to the radial styloid process.

The skin was prepared with povidone and chlorhexidine for subcutaneous local anaesthesia administration. The injected solution comprised 50mL of 0.9% normal saline and 50mL of 1% lidocaine with 1:1,000,000 epinephrine according to the maximum safe dosage of 7mg/kg/ml.

Approximately 10-15 ml of the local anaesthesia was injected into the operative site with a 25G about 20 to 30 minutes before the first incision for a good haemostatic effect.[14,15]

The surgical site was sterilised and prepared for surgery, and preoperative intravenous 1.5g cefuroxime wasadministered to each patient as prophylaxis. The incision was made when the Visual Analogue Score (VAS) was 0. The volar approach was utilised for plating in all cases (Figure-2). The surgery was carried out in the main operating theatre with proper sterilisation protocol.

An additional 5ml of the anaesthetic solution was injected beneath the Pronator Quadratus (PQ) to anaesthetise the periosteum, and the surgery was paused about 30 s for the local anaesthesia to take effect. PQ was reflected from radial attachment for fracture reduction, plate placement, drilling and screw fixations. Locking plates (Double Medical Technologies, Fujian, China) were used in all cases.

The patient's vital signs, bleeding and VAS were recorded every 10 minutes throughout the surgery. Blood loss was calculated according to the amount of blood present in the suction container. In order to decrease the patient's level of anxiety during the surgery, one dedicated staff member of the scrubbed surgeon's team was designated to distract the patient by talking and distracting the attention, especially during drilling the periosteum. We called this effect as vocal anaesthesia.

Fracture reduction was checked under a fluoroscope,and the patients were asked to actively flex and extend their wrists and fingers to examine the stability of the fixation and identify any tendon disorders before wound closure. The skin was sutured with simple interrupted nylon 2-0 sutures (Ethicon, US) and a soft dressing was applied, and the patients were instructed to practice a full range of movement postoperatively. Vital signs and VAS were obtained every half hour after the surgery and patients were discharged after 8 hours. Oral tramadol 37.5 mg/acetaminophen 325 mg combination tablets two times a day as the protocol for postoperative pain control medication for each patient, along with calcium supplements. Patients were advised how to identify compartment syndrome, digital ischaemia and discharge from the wound site, and they were instructed to report immediately to the orthopaedic emergency bay of the hospital should any of these features develop. No intraoperative or postoperative complications were recorded.

The first follow-up visit was after two weeks of surgery. Follow-up was performed in the outpatient clinic along with a follow-upavisit to the physiotherapist for a range of motion exercises and grip strengthening exercises. Fracture union was assessed radiographically, the range of motion was recorded by goniometer, and patient satisfaction was evaluated by the quick Disabilities of the Arm, Shoulder, and Hand (qDASH) questionnaire[16] at fracture union. Patients were followed up till fracture union and restoration of function in the clinic.

Results

Twenty-two (55.0%) patients were male, and 18 (45%) were females. The average age was 45.23±12.22 years. The patient's dominant hand was injured in 26 (65%) cases and non-dominant hand in 14 (35%) cases. The three most common AO fracture configurations were A2 - 13 (32.5%), A3 - 11 (27.5%) and C1 - 6 (15.0%). Table-1

Table-1 Demographics of the categorical data of the study cohort.

Variable	Frequency	Percentage
Gender		
Male	22	55.0
Female	18	45.0
Fracture type (AO/ OTA Classification)		
A2	13	32.5
A3	11	27.5
B3	5	12.5
C1	6	15.0
C2	4	10.0
C3	1	2.5
Side		
Dominant	26	65.0
Non-dominant	14	35.0

Table-2: Descriptive demographics of the study cohort.

Variable	Minimum	Maximum	Mean	Std. Deviation
Age (years)	23	69	45.23	12.22
Grip strength (N)	55	90	72.88	8.07
Operative time (minutes)	50	85	62.50	9.26
Time to union (weeks)	12	20	15.20	2.43
Mayo wrist score (average)	70	95	81.62	7.01
qDASH (average)	5	22	13.33	4.16
Follow up (months)	5	19	10.65	3.54
Blood loss (ml)	5	30	13.50	6.81
Postoperative VAS	1	4	1.47	0.81
Active flexion (degrees)	55	75	64.00	5.08
Active extension (degrees)	45	65	53.12	5.39

N- Newtons, VAS- Visual Analogue Scale, ml- millilitres, qDASH- quick Disability Arm, Shoulder and Hand Index.

shows the information on the categorical data.

The mean operative time was 62.50 ± 9.26 minutes (range, 50-85 minutes) with an average blood loss of 13.50 ± 3.5 ml (range, 5-30 ml) respectively. The postoperative VAS was 1.47 (range, 1-4). The mean time to union was 15.20 ± 2.43 weeks (range, 12-20 weeks) with an average qDASH score of 13.33±4.16 (range, 5-22) and a Mayo wrist score of 81.62 ± 7.01 (range, 70-95). Flexion and extension at the wrist at the time of fracture union were 64.00 (range, 55-75 degrees) and 53.12 (range, 45-65 degrees) degrees respectively with an average grip strength of 72.88 ± 8.07% (range, 55-90%) compared with the contralateral side. Patients were followed up for 10.65 ± 3.54 months (range, 5-19 months). Table-2 illustrates the descriptive results of the study cohort.

Discussion

The current study highlights that WALANT provides postoperative comfort to the patient by eliminating the tourniquet factor with an average postoperative VAS of 1.47 and provides the surgeon a clean surgical field due to the vasoconstrictive effect of epinephrine and simultaneously allows the surgeon to examine hardware impingement.

The haemostatic effect of tourniquet is well known in hand surgery and for surgeries around the joints such as the elbow, knee and ankle. However, the surgery under tourniquet cannot be performed for longer periods due to the risk of necrosis of the underlying and adjacent structures such as nerve paraesthesia or a neurological deficit. Thirdly, tourniquets are not well tolerated by patients postoperatively and tourniquet pain is a common reason for patient discomfort during the postoperative period. On the other hand, the WALANT provides a patient friendly approach and there is decreased postoperative pain. Thus, there is a shorter hospital stay and therefore decreased medical costs and decreased consumption of analgesics and more importantly omits the tourniquet associated complications.

At the time of inception of the study there was no literature on distal radius fixation under WALANT. Although the WALANT technique has been widely described for various minor hand procedures, it has recently been described for fixation of distal radius fractures and ankle fractures.[17,18]

There are some differences between our findings and those of Huang et al.[18] In our study 22 (55%) were males compared with 9 (37.5%) in Huang et al. This is probably attributable to cultural differences and working patterns in our population. Huang's older and predominantly female population (63.5%) are more likely to represent fractures with lower energy trauma. The mean age in our study was 45.23 years compared with 60.9 years (range 20-88 years) in their cohort. The younger population in our study was mostly due to high energy trauma.

Secondly, the most important difference between Huang et al. and our protocol was the concentration of WALANT solution. Huang et al. used a concentration of 1:40000 for his patient whereas a concentration of 1:100,000 was used in our study. Orbach et al. also used a concentration of 1:100,000 augmented with midazolam to counteract any nervousness. We used vocal analgesia to decrease the level of anxiety and keep patient distracted. The lower concentration of WALANT solution augmented with vocal anaesthesia was equally effective as Huang et al. and Orbach et al. cohorts.

The average time to first incision in our study was approximately 26 minutes which was more than Huang et al's[18] minutes due to increased concentration of the WALANT solution.

The average surgical time, blood loss during surgery and postoperative VAS in our study were 62.50 minutes, 13.50 ml and 1.47 respectively, which were very comparable with those of Huang et al. at 64.3 minutes, 18.9 ml and 1.6 figures respectively.[18]

The meantime to fracture union in our study was 15.2 weeks compared with 20.7 weeks in Huang et al.[16] There are a number of possible explanations for this including gender, the energy of fracture, age.

Huang et al. also compared the functional outcomes of distal radius ORIF between WALANT approach and general anaesthesia and found significant results and both techniques were equally effective but the postoperative pain on day one was significantly low for the WALANT group (1.95±0.67) when compared with general anesthesia group with tourniquet (3.27±1.28) with a p-value of 0.001. However, the blood loss was significantly low for the tourniquet group 8.62±9.23 as compared to 22.6±26.82 for the WALANT group with a p-value of 0.001.[19]

The qDASH in our study was 13.33 which compares less favourably with the outcome in their paper with aqDASH of 7.60(18). The most probable cause of comparatively high qDASH in our study might be that most of the cases were carried out byresidents and junior consultants, which describes the easy reproducibility of the WALANT results and equal effectiveness of procedure. Our follow

up period was also shorter 10.65 months as compared to 15.1 months.[18] The shorter rehabilitation time could also lead to the relatively lower flexion and extension range of 64.0° and 53.12° at the wrist which compared to 69.6° and 57.4° respectively.

The WALANT procedures for hand and the wrist at our department are treated as day care surgeries and patients are discharged after eight hours. Whereas, Huang et al. and Orbach et al. had a mean hospitalisation of 1.8 days and within 24 hours. None of our patients reported immediate postoperative complaints such as oedema, compartment syndrome and intolerable postoperative pain. Another important major difference was the application of short arm splint or backslab in Orbach et al. and Huang et al. series whereas we did not augment the fixation with splints and encouraged patients to use their wrist and hand after surgery and had an aggressive postoperative physiotherapy regimen with the physiotherapist.

Sixty-five percent of our patients had a fracture of dominant side and were high demand patients belonging to poor socioeconomic background. The WALANT procedure allowed early fixation avoidance of unnecessary investigations for patient fitness and was cost-effective for the patient and allow early return to work.

The concept of vocal anaesthesia by keeping the patient distracted worked favourably and during our study we did not face any patient with increased level of intraoperative anxiety and the possibility to convert the WALANT procedure to general anaesthesia. Neither any patient had an incident of digital necrosis or the use of phentolamine was required.

The limitation of our study was that it was neither a comparative study nor blinded study. Since this was our initial experience with WALANT, we only included medically fit patients with no comorbidities.

We recommend that further studies should be carried out in patients that are less fit for general anaesthesia, such as older patients or patients rated as American Society of Anaesthesiologists (ASA) grade 3 or 4 to assess the effectiveness of WALANT technique further in this indication.

Conclusion

WALANT is cost-effective, safe, and allows intra-operative assessment of the quality of fixation and impingement can be diagnosed. Furthermore, it avoids complications of general and regional anaesthesia and can be used in patients not fit for general anaesthesia

The limitations of the WALANT approach are the patient selection and local anaesthesia administration. Patients should be adequately counselled for this technique, and in our experience, extreme levels of anxiety should be considered as a relative contraindication. Surgeons should be familiar with the surface anatomy of the distal radius as the success of the technique depends upon the administration of local anaesthesia. We stress the importance of allowing 25-30 minutes before the commencement of surgery to establish adequate anaesthesia and vasoconstriction.

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Ethical Approval: The study was approved by the Institutional Review Board Committee with the IRB number of NO.F.2-81/ GENL-2019/ 11183/ JPMC.

Details of Informed Consent: Written and informed consent was taken before the study.

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