



# Wide Awake Local Anesthesia No Tourniquet (WALANT) Versus Bier's Block, in Internal Fixation of Unstable Metacarpal and Phalangeal Fractures of the Hand: A Comparative Study

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## Abstract

Hand fractures are a common injury in emergency department, and the majority of these are stable injuries that can be treated conservatively with excellent functional results. When respective injuries are characterized as unstable, surgical reduction and stabilization is necessary. Generally, these operations are conducted under regional or general anesthesia to avoid pain and tourniquet for bloodless surgical fields. Wide Awake local anesthesia no tourniquet (WALANT) procedure is described as a local injection of anesthetic agent and epinephrine without tourniquet application, with scope to allow local anesthesia without other sedation and at the same time hemostasis. The purpose of the study is to compare the functional assessment of the hand function during a period of three months after surgical intervention for unstable metacarpal and phalangeal fractures under WALANT versus Biers block. **Material & Methods:** Between May 2021 to October 2022, 43 patients with unstable metacarpal and phalangeal fractures underwent open reduction and internal fixation, 21 cases with Biers block(BB) anesthesia and rest with WALANT technique. Metacarpal fractures appeared in 29 cases and phalangeal fractures in 14 patients. Patients were operated within the first week from the injury. According to implants they employed locking plates, screws and Kirschner wires in two groups. **Results:** At three months postoperatively, Quick Dash Score is better in WALANT group while patients' satisfaction does not differ between two groups. In WALANT group immediate postoperative median VA Score appeared 2/10, while in the Biers block group appeared 6/10. Patients which underwent WALANT technique were discharged on the same day after operation, while the patients with regional anesthesia the next postoperative day. Mean duration of analgesic use was shorter in WALANT group (2,3 days) than in BB group (5,7 days). **Conclusion:** Objective of surgical treatment of unstable hand fractures (metacarpal-phalangeal) is early mobilization and enhance hand functionality to avoid stiffness and tendon adhesions. Wide Awake local anesthesia no tourniquet technique is an alternative sedative procedure which immediately offers postoperative numerous advantages (low-cost technique, no complication from tourniquet, decrease sensation of intra or postoperative pain) compared with Bier's block anesthesia. Based on our results we believe that WALANT technique offers many benefits in surgical treatment of hand fractures and is suggested as first choice anesthesiologist procedure.

**Keywords:** *Metacarpal fracture, phalangeal fractures, internal fixation, WALANT, Biers Block*

## Introduction

Hand fractures (metacarpal-phalanx) are some of the most often fractures confronted at the emergency department. They appear an incidence of 10% - 19% of all human body fractures, while metacarpal fractures presenting a percentage of about one-third of all hand fractures <sup>[1,2]</sup>. They appeared more often in active working population, between second and third decades of life and they come out with a large economic subject in terms of treatment costs and impairment of hand functional incapacity <sup>[4]</sup>. Anakwe et al (2011) in an epidemiology study of hand fractures refer an incidence of 3,7 per 1000 per year for men and 1,3 per 1000 per year for women <sup>[3]</sup>.

The main mechanism of injury is related with the gender. In men is related with direct trauma, or a punching mechanism and the most common fracture is the little finger metacarpal, while in women the mechanism was low energy fall or work-related injuries <sup>[3,5]</sup>.

The majority of metacarpal and phalangeal fractures are stable injuries, and the conservative treatment is the proper therapy. Unstable hand fracture is defined the fracture which cannot be reduced by closed reduction or cannot maintain the reduction, the multiple hand fractures, and the open fractures <sup>[6]</sup>. Day et al (2010) reported that three main factors (shortening, dorsal angulation, rotation deformity) determinate the stability of displaced metacarpal fractures <sup>[1]</sup>. To restore the proper anatomy of metacarpal or

phalangeal bones, open or closed surgical reduction and stabilization with an implant has been proposed with scope to allow early mobilization and to reinstate hand functionality [7,8].

To achieve hand surgery procedure two main factors are essential: Anesthesia to avoid pain and suffering from the tourniquet application and a bloodless surgical field. In general, for surgical fixation of hand fractures various methods have been proposed as: general anesthesia, regional block, Bier block [9]. Sellbrandt et al (2017) presented a study to identify which anesthetic procedure effects postoperative pain for open surgical repair of wrist fracture, concluded that regional anaesthesia in short term presents more benefits compared with other techniques [10]. In situations in which surgery may have prolonged duration of time, the general anesthesia is compulsory as tourniquet becomes intolerable after a mean of twenty minutes (varied from 19.4 to 24,1min), while prolonged duration of application of tourniquet use is associated with nerve, muscle injury and toxic metabolic release in systemic circulation after removal [11,12].

Term Wide awake anesthesia is described as local injection of anesthetic agent(lidocaine) and epinephrine without other sedation and without tourniquet [13]. During pandemic period the WALANT procedure starting to be more popular in hand surgeons because is performed without anesthetic support and is accessed to general surgical theatre [14]. Main advantage of the procedure is that the combination of lidocaine and adrenaline allows to ensure local anesthesia and at the same time hemostasis, obtained patients comfort convenience since there is no existed tourniquet. In addition, intraoperative collaboration of patient to ascertain stability of the fracture osteosynthesis and whether soft-tissue impingement interrupted active range of motion of involved finger [15].

The aim of this research is to compare the evidence of effectiveness of WALANT technique versus Bier's block in surgical fixation of unstable metacarpal and phalangeal fractures, during a period of three months postoperatively in a case series from our hand reconstruction unit according patient's satisfaction, complications, and functional outcomes.

## Material & Methods

This study was performed at the Orthopaedic department of General Hospital of Heraklion- "Venizeleio-Pananeo" from May 2021 to October 2022. The Institutional Ethical Committee approved the study. Inclusion criteria were: I age > 18 years, II open fractures without soft tissue loss, III closed unstable metacarpal or phalangeal unstable fracture, IV isolated or maximum two unstable metacarpal or phalangeal fractures, adequate understanding of language, V follow-up interval at least three months. Exclusion criteria were: I age<18 years old, II diseases as scleroderma, Raynaud, Vasculitis, III corrective osteotomies, IV finger amputation injuries, V open fractures with soft tissue loss that required second operation, VI polytrauma patients, VII hand vascular injuries. Indications for operative treatment were: open fracture, comminuted fractures, fractures with rotational malalignment of digit, shaft angulation >20°-40° (depending on the metacarpal: 2<sup>nd</sup>-3<sup>rd</sup> >20°, 4<sup>th</sup> >30°, 5<sup>th</sup> >40°) and shaft shortening >2mm, intraarticular displacement, angulation >10° (phalangeal fracture).

Forty-three patients (32 men and 11 female) with a mean age 35,5 years old underwent surgical treatment in our department for unstable metacarpal or phalangeal fractures. (Table I) Patients were receiving WALANT or Biers block(BB) randomly. All patients were operated from the author, within the first week from the injury. Twenty-two patients receive WALANT (first group) technique and 21 cases BB (second group). From the first group were 15 cases with metacarpal fractures (two cases with two metacarpals fracture: 4<sup>th</sup> and 5<sup>th</sup>) and 7 cases with phalangeal fractures, while in second group 17 patients with metacarpal fractures (one case with double fracture: 3<sup>rd</sup> and 4<sup>th</sup>) and 4 phalangeal fractures. Open reduction were performed in 35 cases and closed reduction in 8 cases. Open fractures were in 5 cases (one metacarpal grade I, one in proximal phalanx grade I, and rest in middle phalanxes grade II). According to surgical stabilization implant in 31 cases were applied low profile locking plates, in 7 cases only cortical screws and in 5 cases Kirschner wires. (Table II) Before surgery all patients received one dose of cefazoline 2g.

**Table I: Demographic details- Surgery Characteristics**

	Groups	
	WALANT (n=22/%)	BB (n=21/%)
Gender M/F	17/5(77,2%/22,8%)	15/6 (71,4%/28,6%)
Mean Age	33yo (22-46)	38yo (20-52)
Hand Involved (Right/Left)	17/5(77,2%/22,8%)	18/3(85,7%/14,3%)
Dominant Hand (Right/Left)	14/4(63,7%/18,1%)	15/3(71,4%/14,2%)
Work -related Injuries	14(63,7%)	15(71,4%)
Manual Workers	16(72,7%)	17(80,9%)
Mean Surgery Duration (min)	44.2	45.8
Complementary anesthesia	0(0%)	2(9,5%)

WALANT: Wide Awake local anesthesia no tourniquet, BB: Bier's block, n: Number

**Table II: Fracture - Method of Treatment**

	Groups		
	WALANT (n=22/%)	BB (n=21/%)	
Bone (Metacarpal Phalanx)	15/7(68,1%/31,9%)	16/5(76,2%/23,8%)	
Open Fractures	2(9,1%)	3(14,2%)	
Open reduction/ Closed reduction	18/4(81,9%/18,1%)	17/4(80,9%/19,1%)	
Fixation Procedure	K- Wire	2(9,1,%)	3(14,3%)
	Screws	4(18,2%)	3(14,3%)
	Plate	16(72,7%)	15(71,4%)

WALANT: Wide Awake local anesthesia no tourniquet, BB: Bier's block, n: Number

## Anesthesia

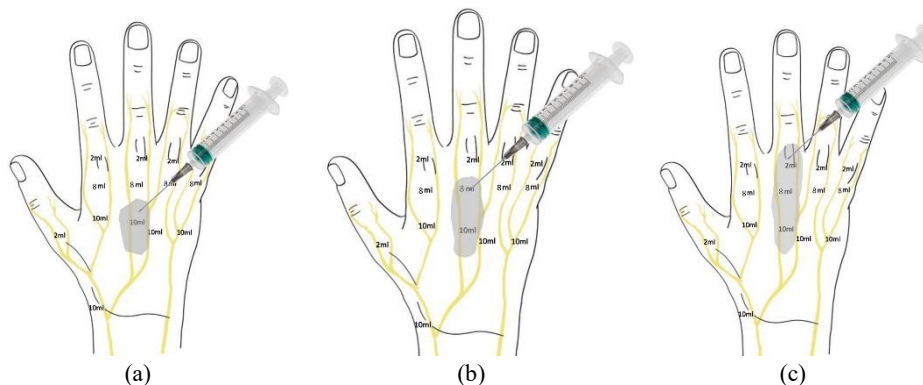
### WALANT procedure

We prepared an analgesic-hemostasis mixture of 10cc of premixed 1% lidocaine with 1:100.000 adrenaline and 1ml of bicarbonate

sodium 8.4% according to Lalonde technique [13]. To decrease injection pain a 27-gauge needles were used, and the rhythm of injection were slow according to Hamelin et al instructions [16]. A total of 20 ml of the mixture was injected for the metacarpal fractures while for phalangeal fracture 12ml. First 10 ml was injected at

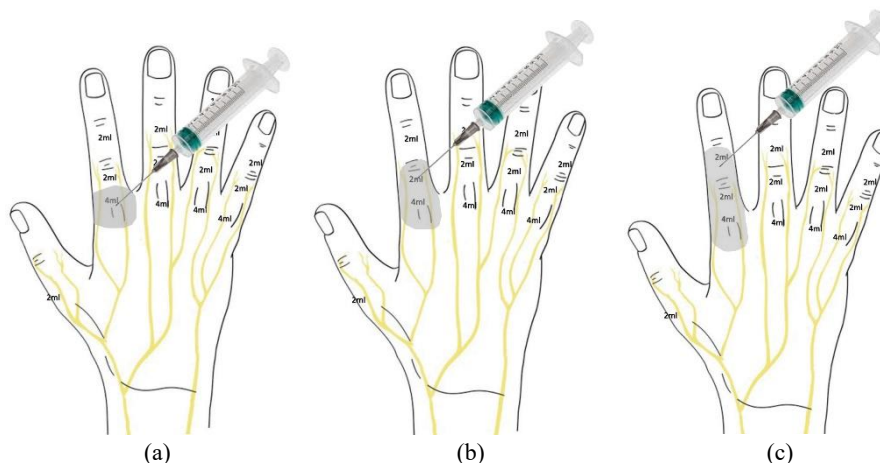
subcutaneous fat on proximal edge at dorsal surface of involved metacarpal. (Fig 1(a),1(b), 1(c)) Next, we injected 8 ml at the middle side of the metacarpal and at metacarpophalangeal joint 2ml. For phalangeal fractures initial we injected 4 ml at dorsal side of metacarpophalangeal joint, and 4 ml in subcutaneous fat of volar side of the metacarpal head, following by 2 ml at dorsal side of the proximal and middle involved phalanges.(Fig 2(a), 2(b), 2(c)) In

cases with two metacarpal fractures initial injection(15ml of the mixture) performed in space between the proximal ends of the involved metacarpal, following by injection at middle area of both sides of the involved bone with a mixture of 8 ml. Finally at the metacarpophalangeal joint we injected 2ml in every involved bone [13,15,17].



**Figure 1:** A total of 20 ml of the mixture was injected for the metacarpal fractures. First 10 ml were injected at subcutaneous fat on proximal edge at dorsal surface of involved metacarpal. (Fig 1(a) After 15 minutes, 8 ml were injected at the middle side of the metacarpal(b) and finally at metacarpophalangeal joint 2ml(c).

Artist's rendition of schematic presentation of injections area at the palmar surface of the hand.(Compliments of Kastani Evangelia).



**Figure 2:** The technique for phalangeal fractures performed is the following: starting from the dorsal side of metacarpophalangeal joint first we injected (a) 4 ml of the mixture (12ml of premixed 1% lidocaine (10ml) with 1:100.000 adrenaline and 1ml of bicarbonate sodium 8,4%) and in 4ml in subcutaneous fat of volar side at the metacarpal head. 15 minutes after the first injection, we continued with a second injection with 2cc at the dorsal side of proximal phalanx (b). Third injection is over dorsal side of the middle phalanx(c).

Artist's rendition of schematic presentation of injections area at the palmar surface of the hand. (Compliments of Kastani Evangelia).

**Biers block procedure**

They were performed at operative room with anesthesiology group. A mixture of solution volume of 40ml was injected intravenous. Specific mixture were contained: Lidocaine 2% in dosage 2,5mg/Kg, Ropivacaine 0,75% in volume 5 ml, Pethidine 1mg/Kg, Dexamethasone 8mg, Ondansetron 8 mg, Magnesium 25% in dosage 20mg/Kg and N/S0,9%. Pneumatic tourniquet was inflated in a mean 250 mmHg (range from 220-270 mmHg) varied from the blood pressure of patient. Sensory and motor blockage was obtained after 10 minutes from the injection.

**Surgical procedure**

The patients were placed in supine position under fluoroscopic control. In WALANT group the operation were started 20 minutes after the injections while in BB group in a mean of ten minutes. The approach was dorsal, between the space of involved metacarpal and the adjacent. In cases with 1<sup>st</sup> metacarpal fracture a Wagner approach

was performed, while in cases with 5<sup>th</sup> metacarpal fracture the approach was dorsoulnar. In patients with phalangeal fractures the approach was dorsal over the midline of the involved phalanx.

After dissection of subcutaneous tissue, the extensor tendons were relocated radially or ulnarly and the juncturae tendinum was sectioned for better visualization of the fracture line. In majority of cases the periosteum was released from bone and the fracture was reduced by traction of the involved digit. The reduction was secured by reduction clamp and imaging intensifier control was performed. The plates were applied in the dorsal surface of the bone, except for 5<sup>th</sup> metacarpal fractures in which they were applied on the ulnar surface of the 5<sup>th</sup> metacarpal bone. In cases which performed closed reduction the fractures (middle phalanx) were stabilized with one or two Kirchner wires.

In WALANT group, patients were asked to perform active range of motion of the involved digit, with scope to control stability of osteosynthesis, tendon friction on the plate or malreduction. In

BB group, range of motion was performed [passively by surgeon](#). (see Video, Supplemental Digital Content)

Finally in both groups, examination with C-arm intensifier was performed to check the final osteosynthesis and screw sizes. Sufficient soft tissue closure over the plate was secured to decrease the extensor tendon irritation and repair the junction tendinum in cases in which it was sectioned.

In both groups postoperatively a volar cast was applied to control swelling, pain and enhance soft tissue healing. The stitches were removed in two weeks, while the cast was remained, depending on the comminution of the fracture and the quality of the osteosynthesis, for a varying period of two to four weeks. In cases with Kirschner wire, they were removed at four weeks postoperatively.

A standard rehabilitation protocol program from the first postoperative day was applied in all patients starting from adjacent joints. Active-assisted exercises were performed in free finger joints while supervised physiotherapy treatment initiated, after immobilization phase and after the cast removal. Continuous passive movement and active assisted exercises in wrist and finger joints were performed initially to restore the range of motion. Patients were trained to follow a personalized home-based daily exercise program to increase range of movement and enhance muscle strength and grip strength in a later phase.

**Statistical analysis**

The mean VAS score was measured on the first postoperative day and one week post operative for each group. The mean duration needed of postoperative analgesia was estimated as well. The mean quick DASH score and a Likert type of scale regarding the satisfaction, three months after the operation were measured.

The means of the VAS score, the mean duration of postoperative analgesia and the mean quick DASH score between the two groups, were compared using the unpaired one tailed t-test. The Mann Whitney U test for nonparametric variables was used to compare the three months post operation satisfaction between the walant and the RA group. The SPSS 25.0 program was used for the statistical analysis.

**Results**

The minimum follow-up was three months. None of the patients missed out the last re-examination. Patients were assessed the first postoperative day, in one, in two weeks and in 1,3 months post surgically. Results were evaluated according to fracture union (determined by follow-up x-Rays), complications, Visual Analogue

pain Scale, Quick Dash Score, duration of postoperative analgesia and satisfaction of the patients (Patient satisfaction rating scale) [18]. According to complications we distinguished them in two categories: first the category of complication regarding the type of anesthesia (change method of anesthesia) and second the category concerned consolidation of the fracture.

All patients with WALANT procedure were discharged the same day from the clinic while the cases from the second group the 1<sup>st</sup> postoperative day except two cases which discharge on second day because of numbness distribution median nerve. The mean VAS score on the first postoperative day for the WALANT anesthesia group was 2,1 (range: 0-4, SD: 2) and 5,7(2-7, SD: 1,25) for the Biers block group respectively and this difference was statistically very significant (p value <0,00001). The mean VAS score one-week post operation for the WALANT group was 1,1 (0-3, SD: 0,75) and for the BB group was 2,3(0-4, SD: 2). This difference was also statistically significant (p value = 0,006). The same result was found for the mean duration of postoperative analgesia, as this variable reflects the mean VAS score.

Regarding complications in WALANT group no patients required additional other anesthetic method to control pain during surgery, while in BB group respectively in two cases in BB group converted to general anesthesia. Consolidation of the fracture was obtained by radiography examination (anteroposterior lateral and oblique views) post surgically in 1,3 months. The union of fracture in majority of cases was obtained with an average period of 5,8 weeks (range from 4,2 to 8,5 weeks) in both groups. Three cases appear with delay union (two from the WALANT group and other from the BB) more than 10 weeks. The mean quick DASH score three months post operation was 4,5(0 -6,8, SD: 1,7) and 6,8(0-9,1, SD: 2,275) for the WALANT and BB group respectively. This difference was statistically significant (p value = 0,0003). We believe that the intraoperative collaboration of the patients enhances two major factors: first, it enables the control of the stability of osteosynthesis and eventual soft tissue impingement (extensor tendons) and second, it gains patients' confidence to initiate active early range of motion.

Finally, all patients' response to major question reported to the satisfaction rating scale with five elements (very satisfied, satisfied, neutral, unsatisfied, very unsatisfied). Out of the WALANT procedure, the majority of patients were very satisfied or satisfied (86,3%) while in BB group the results approximately were the same with a percent of 85,7% to be very or satisfied. (Table III). No difference was found regarding the satisfaction three months post operatively between the two groups (p-value = 0,92).

**Table III: Functional Outcomes**

		Groups		
		WALANT (n=22)	BB (n=21)	P- value
Mean VAS score	1 <sup>st</sup> Postoperative Day	2,1 (0-4), SD: 2	5,7(2-7), SD: 1,25	p < 0,00001
	1 week postoperative	1,1 (0-3), SD: 0,75	2,3(0-4), SD: 2	p = 0,006
Mean Quick DASH score (3 months)		4,5(0 -6,8), SD: 1,7	6,8(0-9,1), SD: 2,275	p = 0,0003
Mean Duration of postoperative analgetic		2,3 days (0-5), SD: 1,25	5,7 days (1-7), SD: 1,5	p < 0,00001
Satisfaction	Very Satisfied	14	15	P = 0,92
	Satisfied	5	3	
	Neutral	3	1	
	Unsatisfied	0	2	
	Very Unsatisfied	0	0	

**Discussion**

Unstable metacarpal or phalangeal fractures are common injuries with the main treatment to be open or close reduction and internal fixations with locking plate or Kirshner wires. Goal of surgical treatment is early mobility of affected digit, decreased stiffness and restore of functional ability of patients. To achieve these, two interrelated factors must be present: sedation to control surgical pain

and tourniquet discomfort and bloodless surgical field. Traditional hand surgery is performed under general anesthesia (GA) or wrist blocks. Brachial plexus anesthesia requires specialized operator, patients must be in monitor to avoid complication(pneumothorax) and this is not successful in all cases [25]. Bier's block (with or without supplemental sedation or analgesia) with arm or forearm tourniquet is the most common type of local anesthesia in hand surgery but presents all complications of tourniquet's application

and system lidocaine toxicity [24,26]. Many studies have described the complications (post-tourniquet thrombosis, bleeding, postoperative pain, blisters, skin burn, ischemia and reperfusion, neuromuscular damage) of tourniquet when application is more than twenty minutes, which additionally aggravates rehabilitation of the initial injury [26,29,32].

Hustedt et al (2017) compared postoperative complication for hand surgery treated with local or regional anesthesia with or without sedation and general anesthesia and suggest that GA must be avoided especially in ages over 65 years old because increased the percentage of complications [27]. Two studies present the superiority of regional anesthesia for hand surgery: Chan et al (2001) compared intravenous regional anesthesia, brachial plexus block and general anesthesia for outpatient's hand surgery patients concluded that regional anesthesia present more favorable patient recovery, decreased postoperative hospitalization care time and less postoperative nausea and vomiting percentage [28]. Galos et al (2016) presented the same point of view in a randomized control study, comparing GA versus brachial plexus block in distal radius fracture surgery treatment and concluded that postoperative pain was decreased in group with regional anesthesia but brachial plexus block is associated with rebound pain if not treated appropriately [29].

Term Wide awake anesthesia is described as local injection of anesthetic agent(lidocaine) and epinephrine without other sedation and without tourniquet introduced by Lalonde(2009) [15]. Additional, author suggesting information's about areas of injection, volume and contains of mixture anesthetic for flexor tendons repair, also introduced active collaboration(intra-operative) of the patients as a part of surgical technique [15,17]. In the following years until pandemic period of Covid-19 many researchers presented their positive results applying WALANT technique to their studies or compared with other anesthetic procedures in hand surgery, but the method did not have much appeal in hand surgeons' community [19,20]. The COVID-19 pandemic period enforced an alteration according to functionality of the staff (anesthesiologist) and health facilities for the treatment of the affected patients with virus. This new situation inducted to hand surgeon to find alternative methods of anesthesia with similar results of the existing ones. During pandemic period the WALANT procedure starting to be more popular in hand surgeons because is performed without anesthetic support and is accessed to general surgical theatre or emergency department area, for minor hand surgeries (carpal tunnel syndrome, trigger finger) or flexor tendon injuries of the hand [19-22]. Wide Awake local anesthesia no tourniquet procedure used in the following years by other hand surgeons increased the indications of this anesthetic procedure and Brown et al(2021) described the indication of the WALANT procedure which except primary indication included and complex injuries of the hand or wrist [15,30].

In the literature, there are researchers who present the benefits of the WALANT method compared with GA or locoregional anesthetic procedures. Ki Lee et al (2020) showed that in minor hand surgery (carpal tunnel, trigger finger release, De Quervain) the duration of effective anesthesia was double in WALANT in contrast with regional anesthesia and necessity of the administration of analgesics, in the first two days was lower in WALANT [31]. Abitbol et al (2021) compared WALANT and RA in surgical plated treatment of unstable distal radius fractures showing better functional outcomes, resumption to previous work at three months and earlier stopped analgesia with the WALANT technique [33]. Xing et al (2014) in 7 patients with metacarpal fracture and 21 cases of hardware removal with WALANT anesthetic approach suggested that this method eliminated the risk of the GE or RA and tourniquet's application, while intraoperative collaboration of the patients achieves revision of the osteosynthesis if necessary, medical cost is lower, and patients' satisfaction is greater [34]. Feldman et al(2020) in 10 patients with unstable metacarpal fracture with WALANT suggested the method because the surgeon has the advantage to

reduce malunion or revision of the osteosynthesis especially in internal fixation with headless screws [24]. Moscato et al(2021) compared WALANT versus local anesthesia with peripheral nerve block for trapeziometacarpal arthroplasty report better functional outcomes in WALANT group [36].

In our study, in three cases with phalangeal fractures (two proximal one cases middle) in active range of motion we distinguished rotational deviation, and we revised the osteosynthesis (two cases with plate and in other with screws). This possibility cannot be provided by the other anesthetics procedures. According to functional outcomes (Quick Dash Score), postoperative pain (VAS) or use of analgesics, hospitalization care time we had the same satisfied results with Abitbol and Lin in WALANT procedure [33,38].

Finally, according to the cost of hand surgery, WALANT reduces the cost because preoperative tests are not necessary, anesthesiologic team, medication or monitoring are not needed, and hospitalization care time is decreased [37]. Lin et al(2021) estimated that cost of treatment for internal fixation of metacarpal fracture is lower than 287 USD per cases in WALANT instead GA [38]. Maliha et al(2019) presented that cost in trigger finger with WALANT is decreased to a third compared with convectional anesthesia, while Bismil et al(2012) demonstrated \$ 3,2 million in saving with WALANT anesthetic procedure on the first 1000 cases with minor hand surgery with respective technique [39,40].

The strength of this study is that statistically significant differences were found regarding the short-term postoperative pain and the mean quick DASH score three months post operative between the Walant and the RA group, favoring the Walant technique. This result is most likely explained by the fact that the Walant type of anesthesia allows a quicker rehabilitation and mobilization compared to the BB technique. The limitations of this study are, I that this is a retrospective study based on the results of a single institution, II this is a non-blinded retrospective cohort study with small sample size of each group. Grouping of the patients was randomized without patient preferences. A small number form WALANT group was anxious about ability of the procedure after the explanation of the method, III the follow-up time of patients is short and maybe a longer time may present different results.

## Conclusion

The main purpose of surgical treatment of unstable hand fractures (metacarpal-phalangeal) is early mobilization to enhance hand functionality and to avoid stiffness functional incompetence. Wide Awake local anesthesia no tourniquet technique is an alternative sedative procedure which immediate offers postoperative numerous advantages (low-cost technique, decreased complication from tourniquet, appear less o intra or postoperative pain) compared with Bier's block anesthesia. According to functional outcomes, WALANT procedure seems to be better than Biers block, and this relies on method ability of intraoperative collaboration between patient and surgeon. Based on our results we believe that WALANT technique offers many benefits in surgical treatment of hand fractures and can be suggested as a first choice of anesthesiology procedure.

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## Conflict of interest

The authors declare that they had no conflict of interest.

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