WIDE AWAKE LOCAL ANESTHESIA NO TOURNIQUET (WALANT) IN HAND SURGERY - A RETROSPECTIVE STUDY ON 400 CASES

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WIDE AWAKE LOCAL ANESTHESIA NO TOURNIQUET (WALANT) IN HAND SURGERY - A RETROSPECTIVE STUDY ON 400 CASES. (Abstract): The study **aimed** to evaluate and confirm the efficacy and safety of WALANT anesthesia in hand surgery. **Materials and methods**: A retrospective analysis was conducted on 400 hand surgeries performed under WALANT between January 2020 and December 2023. Diseases included carpal tunnel syndrome (CTS), Dupuytren disease (DD), trigger finger (TF), also tendon injuries, phalangeal and metacarpal fractures, and tumor excisions. Data collected included patient demographics, anesthetic dosage, onset time, dilutions, intraoperative incidents (pain, bleeding, discomfort), complications, surgical duration, hospitalization, patient satisfaction (VAS), and functional outcomes (DASH and MHQ scores). Statistical analysis was performed using *SPSS version 29.0*, with regressions (ANOVA) and Pearson correlation coefficients. **Results:** The mean hospitalization time was 3.5 hours, with 95% of patients discharged the same day. Complications were low (5%), and functional outcomes improved significantly, with DASH scores improving by 66.7% on average. No cases of digital necrosis or other vascular complications occurred. **Conclusions**: WALANT is a safe, effective, and resource-efficient technique for hand surgery. It optimizes hospital resources, enhances patient outcomes, minimizes costs, and supports sustainable healthcare. **Keywords:** LOCAL ANESTHESIA, WALANT, HAND SURGERY, LIDOCAINE, EPINEPHRINE.

INTRODUCTION

The advancement of hand surgery, orthopedic surgery, and various other surgical disciplines has been markedly enhanced by the integration of minimally invasive anesthetic techniques, such as WALANT (Wide Awake Local Anesthesia No Tourniquet) (1). In the early 2000s, Donald Lalonde pioneered the use of a combination of local anesthesia (1% lidocaine) and epinephrine (1: 100,000) to develop WALANT for vasoconstriction, creating a bloodless surgical field without the need for general anesthesia or tourniquets (2). This technique allows

real-time functional testing while keeping patients awake, improving precision, safety, and recovery times (3). While initially popularized in hand surgery for pathologies like tendon injuries, carpal tunnel syndrome and fractures, it has proven effective in a variety of other surgical domains (4). Hand surgeries relied on general or loco-regional anesthesia in combination with a tourniquet, a practice associated with risks such as pain, nerve damage, and prolonged recovery. The WALANT technique, utilizing a solution of 1% lidocaine with epinephrine (1: 100,000), provides local anesthesia and a bloodless surgical field, while eliminating the complications and risks associated with tourniquet use and the need for additional sedation required with other anesthetic methods (2-5).

Early concerns about the safety of epinephrine in hand surgeries were alleviated through studies demonstrating its safety at low concentrations, leading to WALANT's global acceptance (5, 6). Lalonde *et al*. was initially cautious about using epinephrine in hand surgeries due to concerns over necrosis from intense vasoconstriction. He indicated the use of phentolamine as an antidote (7, 8). This type of local anesthesia is indicated and effective in hand surgeries, including both acute trauma cases and chronic pathologies, as well as in palliative hand surgery (9, 10). It has also shown significant advantages in orthopedic surgery, including clavicle fractures, distal radius fractures, ankle fractures, metatarsal fractures, and certain types of joint procedures (11). WALANT's localized approach also reduces risks associated with systemic anesthesia, making it a safer option for patients with comorbidities. Most patients can be safely discharged within a few hours of the procedure, with minimal postoperative care required due to the rapid recovery associated with WALANT, improving hospital efficiency and patient satisfaction (11-13).

By eliminating the need for anesthesia personnel, extensive monitoring, and recovery units, it has significantly lowered the cost of surgeries (14). As a green surgical technique, WALANT contributes to sustainable practices by reducing medical waste and resource utilization. Its impact on modern surgical practices across hand surgery, orthopedics, reconstructive surgery, and palliative care highlights its versatility and transformative potential (15). Due to the fact that this study was conducted during the COVID-19 pandemic, specific challenges emerged regarding patient care and safety (16). In this context, the adoption of WALANT has emerged as the preferred, and often the sole feasible approach for patient management, establishing it as a gold standard in hand surgery anesthesia (17-19). A retrospective study was conducted on 400 hand surgeries performed under WALANT between January 2020 and December 2023. All surgeries performed under WALANT anesthesia.

MATERIALS AND METHODS

A retrospective study was conducted on 400 hand surgeries performed under WALANT between January 2020 and December 2023. All surgeries were done at Plastic and Reconstructive Surgery Clinic from the Emergency County Hospital "Sf. Spiridon" of Iasi. On admission, the informed consent was obtained from all patients in the study group. The ethics committee of the hospital has granted approval for the reporting of the present study. The inclusion criteria for the study group were as follows: patients over 18 years of age undergoing hand surgery with indication of local anesthesia - carpal tunnel syndrome,

trigger finger, Dupuytren disease, tendon injuries or tenolysis, metacarpal and phalangeal fractures, patients who consented to this type of anesthesia, patients with no known allergies to lidocaine or epinephrine, ability to remain awake and tolerate the procedure. Exclusion criteria were: patients under 18 years old, patients who did not consent for this type of anesthesia, pathologies including vascular damage involving microsurgery or intricate vascular techniques, patients with psychiatric or neurological conditions impairing their ability to remain calm during surgery, patients with significant cardiac conditions contraindicating the use of epinephrine. The recorded data were collected from the medical records (observation sheet and the hospital's electronic information system) of hospitalized and treated patients. In the studied group, were registered: epidemiological data (age, gender, urban or rural residence) comorbidities, diagnosis, the amount of anesthetic used, the dilutions used, waiting time until its onset, intraoperative incidents/accidents (pain, bleeding, doctor/patient discomfort), duration of the surgery, functional outcomes (with DASH scale) measured at 6 weeks and 3 months, complications, hospitalization time and patient satisfaction level using VAS scale. In all instances, surgical procedures were conducted under local anesthesia using a solution of 1% lidocaine with epinephrine in a concentration of 1: 100,000 or 1: 200,000. Sodium bicarbonate (8.4%) was not used for buffering in any case. Pain during the procedure was objectively monitored through vital signs (blood pressure, heart rate) and subjectively through patient feedback, describing pain as non-existent, minimal, tolerable, or intolerable. Patient comfort was assessed both by tracking vital signs and through their subjective response.

Statistical analysis. The data were analyzed using *SPSS Version 29*, with the following statistical techniques: descriptive statistics for demographic data, anesthetic use, and hospitalization time, chi-Square Tests to analyze differences in complication rates between different types of surgeries, paired T-Test for comparing preoperative and postoperative DASH scores, ANOVA for comparing costs and outcomes across different surgical procedures, regression Analysis to identify predictors of postoperative functional outcomes, including age, comorbidities, and anesthetic volume

RESULTS

The gender distribution in the research cohort is represented by 55% male patients with a male/female = 1/1.22 The age of the patients ranged from 18 to 85 years, with a mean age of 50.6 years. The analysis showed that 70% of patients came from urban areas, consistent with findings in WALANT literature, where urban settings dominate due to the technique's accessibility in outpatient centers. However, the remaining 30% rural representation in the data reflects a notable proportion of trauma cases, which may be associated with labor-intensive occupations common in rural regions. The largest proportion of patients was aged 31-50 years (40%), followed by 51-70 years (32.5%), reflecting the prevalence of working-age adults in the study cohort. Carpal tunnel syndrome (CTS) was the most frequently treated condition (29%), followed by flexor and extensor tendon injuries 26,75%), metacarpal and phalangeal fractures (18.5%), trigger finger (TF) (12%), Dupuytren's disease (DD) (7%), and other surgeries (6.75%) (tab. I).

TABLE I.
Demographic data of the studied group

Pathology	18-30 y	31-50 y	51-70 y	71-85 y	Male	Female	Urban	Rural	Total	(%)
Tendon injuries	5 (1.25%)	42 (10%)	45 (8.75%)	15 (2.5%)	58 (14.5%)	49 (12.25%)	72 (18%)	35 (8.75%)	107	26.75%
CTS	7 (1.75%)	50 (12.5%)	44 (11%)	15 (3.75%)	62 (15.5%)	54 (13.5%)	80 (20%)	36 (9%)	116	29%
fractures	10 (2.5%)	38 (9.5%)	20 (5%)	6 (1.5%	48 (12%)	26 (6.5%)	40 (10%)	34 (8.5%	74	18.5%
TF	5 (1.25%)	12 (3%)	24 (6%)	7 (1.75%)	23 (5.75%)	25 (6.25%)	27 (6.75%)	21 (5.25%)	48	12%
DD	2 (0.5%)	10 (2.5%)	11 (2.75%)	5 (1.25%)	16 (4%)	12 (3%)	14 (3.5%)	14 (3.5%)	28	7%
Other	2 (0.5%)	8 (2%)	6 (1.5%)	11 (2.75%)	13 (3.25%)	14 (3.5%)	15 (3.75%)	12 (3%)	27	6.75%
Total	31 (7.75%)	160 (40%)	130 (32.5%)	59 (14.75%)	220 (55%)	180 (45%)	248 (62%)	152 (38%)	400	100%

CTS= carpal tunnel syndrome, TF= trigger finger, DD= Dupuytren disease, y=year

Patients were instructed to inform the surgeon if they experienced any pain or discomfort, even if minor. Initially, 0.3 to 0.5 mL of anesthetic was injected just beneath the dermis. Once the patient no longer reported pain, the remainder of the anesthetic was administered by advancing the needle to a depth of approximately one cm. The total anesthetic volume did not exceed 20 mL for CTS and 15 mL for each affected digital ray in cases of DD. The volume of anesthesia used and its dilution were key factors influencing both the quality of the surgical field and patient satisfaction (fig.1). Procedures that required higher volumes of anesthesia (e.g., DD) often used higher dilutions, which led to a lower incidence of complications such as intraoperative bleeding. For instance, the 1: 200,000 dilution of epinephrine provided an optimal balance between pain control and vasoconstriction, ensuring effective hemostasis during the surgery while maintaining patient comfort, confirming that the 1: 200,000 dilution allowed for rapid onset and reduced intraoperative bleeding. The reduced anesthesia volume (10-14 mL) used in the cohort group aligns with the WALANT principle of minimizing invasiveness without sacrificing efficacy (fig. 1).

For CTS cases, 10 mL the anesthetic solution was injected on each side near the incision site, and the remaining 10 mL was administered into the surrounding skin area where hypoesthesia was already present. This method was similarly employed in DD cases, with the anesthetic being injected around the planned incision sites. In TF cases, no more than 1 mL of anesthetic solution was injected into each affected phalanx. Throughout the anesthetic administration, patients were conscious, cooperative, and did not receive any sedatives. The onset of anesthesia occurred within 6 to 15 minutes (tab. II).

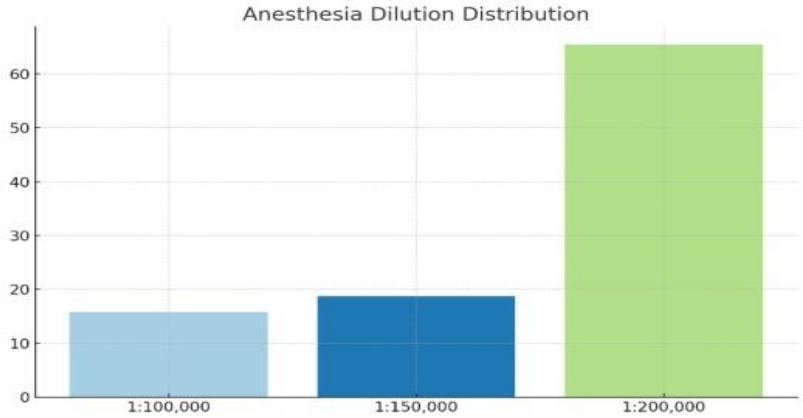

Fig. 1. Anesthesia dilution distribution

TABLE II.

Anesthesia installing time (minutes)

Range	Number	Percentage	Mean Total Group (Max / Min)	Other Metrics
< 10 min	34	8.5%		TF: 7.84 (10/5)
10-14 min	207	51.67%	13.93 (20/8)	Tendon injuries: 11.2 (14/7) CTS: 11.41 (15/8), Other: 12.31 (20/5)
15-20 min	159	38.75%		DD: 16.41 (20/8), Fractures: 14.82 (20/8)

TF-trigger finger; DD- Dupuytren's disease

Key finding from the study is the reduced hospitalization time. Percentage of patients were discharged within 3-4 hours post-surgery (fig. 2).

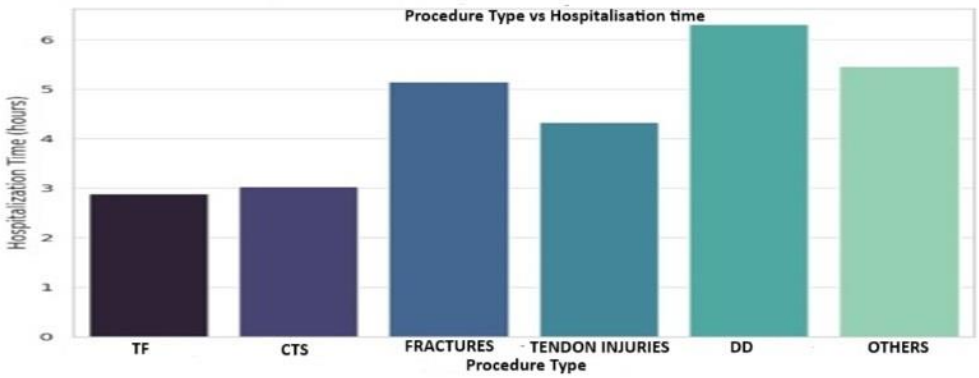

Fig. 2. Procedure type *vs.* hospitalization time

The amount of anesthetic solution used was 10-14 mL in almost half of the cases (49%), with a mean volume of 14.61 mL across the entire group. Subgroup analysis revealed that Dupuytren disease required the highest mean anesthetic volume (18.92 mL) but still under 20-25 mL how literature recommend, while trigger finger required the lowest (4.13 mL) (tab. III). These findings indicate that even if there are more complex procedures, such as those for Dupuytren's disease, which typically necessitate higher volumes of anesthetic to ensure adequate analgesia and hemostasis, lower volume with higher dilution can have good results (tab. IV).

TABLE III.

Anesthetic solution (mL)

Range	Number	Percentage
< 10 mL	37	9.25%
10-14 mL	196	49%
15-19 mL	134	33.5%
>= 20 mL	31	7.75%

TABLE IV.

Mean values by group (anesthetic solution)

Group	Mean (Max/Min)
Total Group	14.61 (20/2)
TF	4.13 (5/2)
CTS	15.43 (20/14)
Fractures	17.33 (20/15)
Tendon Injuries	8.53 (10/6)
Dupuytren's Disease	18.92 (20/10)
Other	11.37 (12/10)

Calculating the Pearson correlation coefficients and their p-values based on the cohort patients collected data the study revealed: Anesthesia Volume *vs.* Onset Time - Correlation coefficient (r): 0.99, p-value: 0.011. There is a strong positive correlation between anesthesia volume and onset time, meaning higher anesthesia volumes are associated with longer onset times. Anesthesia volume vs. satisfaction - correlation coefficient (r): -0.998, p-value: 0.002. There is a very strong negative correlation, indicating that higher anesthesia volumes are associated with lower patient satisfaction (fig.3). Dilution Level vs. Satisfaction. Correlation coefficient (r): -0.994, p-value: 0.006. There is a strong negative correlation, suggesting that higher dilution levels are associated with higher patient satisfaction. These results are statistically significant (p-value < 0.05), supporting the hypothesis that lower anesthetic volumes and more diluted solutions can lead to shorter onset times and higher patient satisfaction (fig. 3).

Hospitalization time differed significantly by procedure type, with shorter stays noted for simpler procedures like carpal

tunnel syndrome ($p < 0.001$). The absence of a tourniquet and the localized anesthesia significantly reduced the discomfort commonly associated with traditional methods. In terms of complications, the study recorded a no accidents or incidents during surgery. There were no instances of digital necrosis or vascular complications, demonstrating the safety of WALANT in this cohort. The absence of significant intraoperative bleeding or the need for epinephrine reversal agents, such as phentolamine, further supports the effectiveness of WALANT as a reliable and safe anesthetic technique.

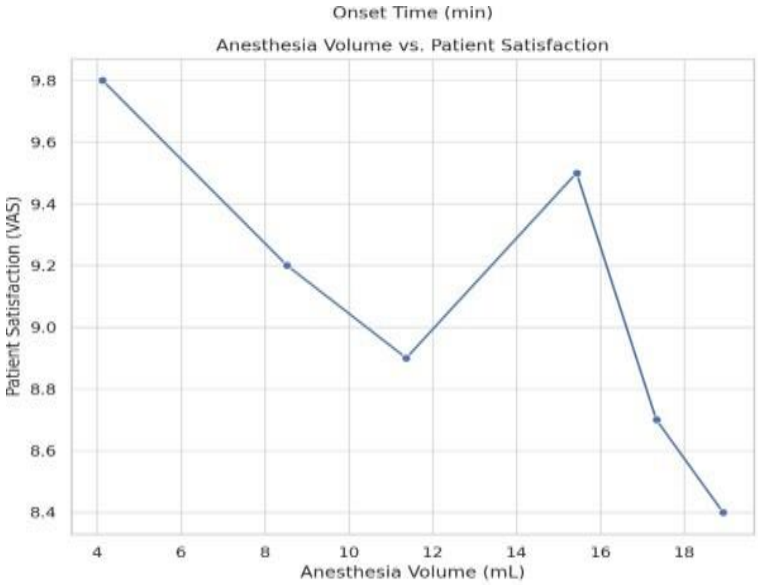

Fig. 3. Anesthesia volume *vs.* patient satisfaction

Patients in the older age groups, particularly those aged 51-70 and 71-85 years, experience longer hospital stays. This increase in hospitalization time can be attributed to several factors. Older patients are more likely to have multiple comorbidities, such as diabetes or cardiovascular diseases, which can complicate both surgery and recovery. Additionally, age-related physiological changes, such as reduced tissue healing capacity and a higher likelihood of postoperative complications, may necessitate prolonged monitoring and care (fig. 4).

Patient satisfaction was assessed using a Visual Analog Scale (VAS) and DASH scores, at 3 weeks and 6 months with results indicating high satisfaction rates. The average VAS score for pain during the procedure was low, ranging from 0 to 2, demonstrating that the anesthesia provided adequate pain relief. Furthermore, satisfaction was correlated with the volume and dilution of the anesthetic. Higher volumes of anesthesia, especially when diluted appropriately, contributed to better pain control and comfort during the procedure. Notably, patients reported less discomfort and quicker recovery times when larger dilutions (greater than 1: 200,000) of lidocaine with epinephrine were used, resulting in a bloodless surgical field with minimal pain (tab. V).

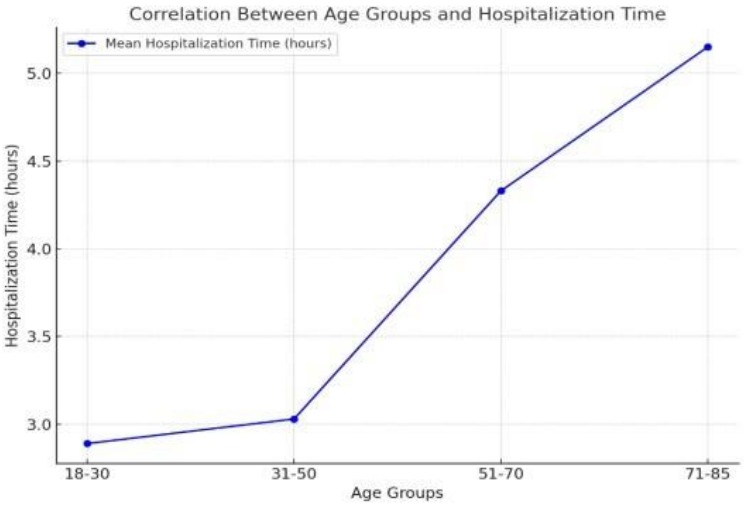

Fig. 4. Correlation between age groups and hospitalization time

TABLE V.
Functional outcomes of surgeries using WALANT anesthesia

	Number of Patients	MHQ Score (3 weeks)	MHQ Score (6 months)	DASH Score (3 weeks)	DASH Score (6 months)
CTS	116	65±5,2	85.4 ± 4.5	38±3.1	6.3 ± 2.1
TF	48	67±4,3	83.2 ± 5.1	32±5.2	7.1 ± 2.9
Fractures	74	58±6.7	79.5 ± 6.0	45±4.3	12.4 ± 3.5
Tendon Injuries	107	62±5.5	81.3 ± 5.6	40±2.2	10.2 ± 2.8
DD	28	59±6	76.8 ± 7.3	41±3.7	14.7 ± 4.0
Other	27	57±3.9	78.5 ± 6.4	47±2.5	13.1 ± 3.2

DASH-Disabilities of the Arm, Shoulder, and Hand score; MHQ- Michigan Hand Questionnaire = Trigger finger, DD= Dupuytren disease CTS= Carpal tunnel syndrome

DISCUSSION

The application of WALANT, particularly in trauma-related surgeries, compared to its predominant use for elective procedures in the literature. These differences likely reflect the demographic and clinical characteristics of the patient population, demonstrating WALANT's versatility in addressing both degenerative and trauma-related conditions (19, 20).

A significant reduction in hospitalization time, with the majority of patients being discharged within 3-4 hours, compared to the 4-6 hours of hospitalization typically reported in WALANT literature. Studies like Lalonde (2005) and Fitzcharles-Bowe (2007) suggest that WALANT procedures usually require about 4-6 hours of observation (21, 22). This study highlights the potential for even shorter hospital stays, indicating that using lower anesthetic volumes can streamline

recovery and enhance discharge efficiency without compromising patient safety.

As it for demographics, this cohort, with 40% of patients aged 31-50, contrasts with the older demographic typically reported in WALANT studies, where patients are usually aged 50-55 years (Fitzcharles-Bowe, 2007; Casal *et al*., 2011) (23, 24). The younger patient population in this study likely reflects a higher proportion of trauma-related surgeries, such as tendon injuries and fractures, which are less commonly explored in WALANT studies focused on elective procedures. This finding underscores WALANT's versatility in handling both degenerative and trauma-related conditions, extending its application beyond what is usually seen in the literature.

The study used significantly lower anesthetic volumes (10-20 mL), compared to the 20-40 mL often reported in other WALANT studies (e.g., Martin *et al*., 2005) (25). These reduced volumes were sufficient for adequate pain control, aligning with WALANT's principle of minimizing invasiveness. This result contrasts with studies by Lalonde (2005) and Kalle *et al*. (2010), which employed larger volumes of anesthesia and possibly had higher complication risks (26). Moreover, study highlighted that higher dilution of local anesthetic contributed significantly to both the safety and effectiveness of the procedure. The 1: 200,000 dilution of epinephrine used in the study group was more diluted than in many studies, where concentrations typically range from 1: 100,000 to 1: 150,000. This higher dilution allowed for better pain management and reduced the risk of complications such as excessive vasoconstriction and intraoperative bleeding (27). The surgery for carpal tunnel syndrome (CTS) tends to have shorter recovery times (Lalonde, 2005; Foucher *et al*., 2015), this study demonstrated that WALANT is equally effective for more complex procedures, such as metacarpal and phalangeal fractures and Dupuytren's disease (DD), which require higher anesthesia volumes (26). However, even these complex surgeries benefited from higher dilution (1: 200,000), which allowed for minimal complications and quicker recovery (28-30). The study's safety profile, with no accidents or complications, is consistent with the low complication rates reported in the literature, though it exceeds other studies that recorded rare complications (31). The absence of digital necrosis, vascular complications, or the need for reversal agents further supports the effectiveness and safety of WALANT when lower volumes and higher dilutions are used. This emphasizes the safety of WALANT, especially in more complex surgeries, where other studies report a higher likelihood of complications (32).

CONCLUSIONS

Considering the numerous advantages of the WALANT technique, including its rapid onset of anesthesia, efficiency, and safety profile, as well as the wide range of surgical procedures it facilitates, it represents a highly effective alternative to classical anesthesia techniques. WALANT is associated with minimal risks, significantly reduced waiting and hospitalization times, and eliminates the need for preoperative fasting or complex monitoring. Moreover, it contributes to increased patient satisfaction by providing a comfortable and awake surgical experience with

faster recovery. Given these benefits, WALANT could be regarded as a gold standard for elective or emergency hand surgery procedures.

CONFLICTS OF INTEREST AND FUNDING

All the authors declare no funding received and no conflict of interest.

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