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Wide Awake Local Anesthesia No Torniquet in Hand Surgery

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***Abstract*: This paper presents a study on wide awake local anesthesia no torniquet in hand surgery.**

***Keywords*: WALANT, Hand surgery.**

1. Introduction

Hand injuries and surgeries are one of the most common operations that are performed on an outpatient basis while there is no consensus on the optimal method of anaesthesia for it. A variety of anaesthetic techniques are used including Brachial block, Intravenous regional anaesthesia, Bier's block, local anaesthesia etc. Most commonly used method was General anaesthesia up until a decade ago.

Canadian plastic hand surgeon Dr. Lalonde first implemented Wide awake local anaesthesia no tourniquet (WALANT) to decrease wait times for surgery. He formally proposed the concept in 2005 and has since internationalized it.

WALANT in hand surgeries includes subcutaneous injection of a large volume of diluted lidocaine and epinephrine. These agents provide conditions suitable for hand surgery without sedation and tourniquet.

The exclusion of sedation makes it possible to perform more procedures in an ambulatory setting rather than rely on general anaesthesia only in the operating room.

2. Aim and Objectives

To study outcome in patients operated with WALANT technique with respect to various patient satisfaction measures and usefulness and ease of WALANT surgery from surgeon's and patient's point of view.

Primary objective:

- To study the feasibility of WALANT surgery and patients` compliance

Secondary objective:

1. Ease of giving local anaesthesia at different sites.
2. To know on-table tendon disruption rates.
3. To know the complication rates like vaso-vagal syncope, post-operative pain. infection requiring antibiotics, stiffness.
4. To know the Patient Satisfaction as measured by a patient satisfaction questionnaire.

3. Materials and Methods

Study Location:

Department of Plastic Surgery, Jawaharlal Nehru Medical College and Hospital (JNMCH), AMU, Aligarh.

Study Duration:

Oct 2019 to Nov 2021

Study Design:

Hospital based prospective cohort study

Study Population:

All patients of age over 14 years of either gender that were operated in JNMCH between using Wide Awake Hand Surgery technique after taking informed and voluntary consent to be part of a study were enrolled in this study group.

Inclusion Criteria:

1. Patient giving consent to be included in the study.
2. Over the age of 14 years.
3. All patients with acute hand injuries including flexor tendon injury, extensor tendon injury, bony fractures i.e., all cases who donot require general anesthesia.
4. Carpal tunnel release, trigger finger release.
5. Camptodactyly, clinodactyly.

Exclusion Criteria:

1. Patient not giving consent for study.
2. Patient not consenting for photography and publishing literature.
3. Patient with unrealistic expectations.
4. Patient with apparent psychiatric condition.
5. Patient with history of Raynaud's Disease or Raynaud's phenomenon.
6. Patients with co-morbidity that contraindicates the use of epinephrine.
7. Patient having bleeding disorder.
8. Segmental tendon loss or large nerve gap
9. Sub-acute or chronic ruptures (ruptures > 6 weeks old)
10. Active or previous infection in the wound bed
11. Requirement of delayed repair
12. Complex or multisystem injuries including head injuries

4. Observations and Results

This prospective study was conducted in the Department of

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Plastic surgery, JNMCH, AMU, Aligarh.

A total of 200 patients were studied between the period October 2019 to November 2021.

In the study, 103 (51.5%) were males and 97 (48.5%) were females.

Age range of patients was 14 years to 85years; for males range was 14 to 70 years and for females it was 18 to 82years.

The mean age of patients was 42.1 years, for males was 44.28 years and for females was 37 years.

Table 1
Patient distribution according to age & sex

Age group	Male	Female
14-30 yrs	25(12.5%)	23(12%)
30-50yrs	64(32%)	62(31%)
Above 50 yrs	14(7%)	11(5%)

The most commonly performed surgery is for tendon repair (40.5%) under casualty i.e., emergency OT.

Most commonly performed routine surgery was carpal tunnel release (12.5%).

Table 2
Patient distribution according to procedure undertaken

Different types of procedures undertaken	No. of patients
Carpal tunnel release (CTR)	25(12.5%)
Excision of lesion (L)	28(14%)
Dupuytren's fasciectomy (DF)	15(7.5%)
Tendon injuries (STT)	81(40.5%)
Fracture Fixation	28(14%)
PBC Release (PBC)	9(4.5%)
Tenolysis/tendon transfer (TT)	8(4%)
Missed Nerve injury repair (NR)	6(3%)
Total	200

50.5% patients reported pain score during anesthetic injection below. Most commonly reported VAS during anaesthesia injection was 6(35%). Only 7.5% patients felt pain score >8.

Table 3
Visual analog score during Anesthesia injection

VAS during Anesthesia Injection	No. of Patients
1-4	101(50.5%)
4-8	84(42%)
>8	15(7.5%)

67.5% patients had pain scores below 4 during the whole procedure. Only 12.5% patients had pain score above 8 during the procedure, repeat dosage was given or additional intravenous analgesic was administered for the same.

Table 4
Worst pain felt (Visual Analog Score) during procedure

VAS during procedure	No. of Patients
1-4	135(67.5%)
4-8	40(20%)
>8	25(12.5%)

In order to categorise according to patient comfort during surgery, 4 categories were created to divide patients, Category I being patient comfortable with no anxiety, and no complains regarding OT environment and staff behaviour. Category II being patient pain free but uncomfortable being aware of surgery being done. Category III patients felt pain during procedure. Category IV patients were anxious during procedure.

48.5% were comfortable during the entire procedure and had no problem being aware of the procedure being done on them or anxiety related to operative environment. Most patients were pain free but 27% were uncomfortable with the awareness of surgery being done. 18% patients felt pain during the procedure.6.5% were anxious due to operative environment or surgical procedure. 90 % of Category IV patients were females (p value<0.005).

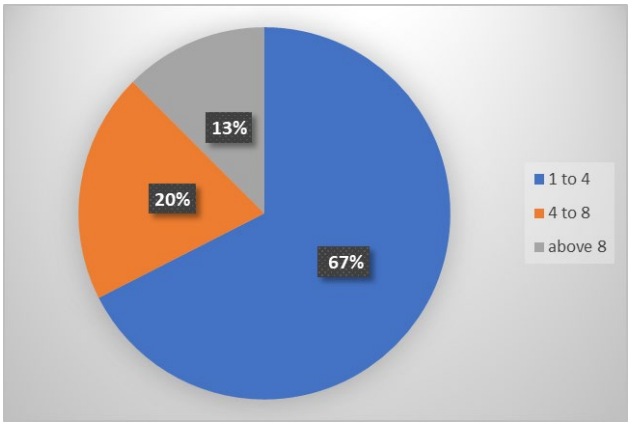


Fig. 1. Pie chart of Worst pain felt (Visual Analog Score) during procedure

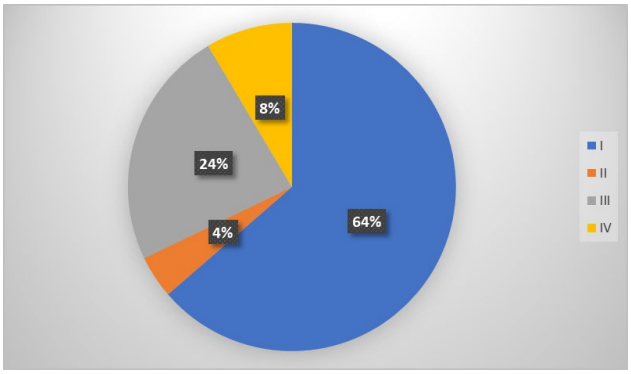


Fig. 2. Pie chart of patient comfort during surgery

Most of the surgeries were performed under 30 mins (51%). 44.5% were surgeries were over half an hour but less than an hour duration. Only 9 (4.5%) surgeries performed exceeded the hour limit. Patients who had duration of procedure more than 60mins was due to multiple tendon injuries. Repetition of dose as required was done.

Table 5
Duration of procedure

Duration of surgery	No of patients
<30 mins(I)	102(51%)
30-60mins(II)	89(44.5%)
>60mins(III)	9(4.5%)

Most of the patients(58.5%) did not require admission and were discharged immediately after the surgery with instructions and post-op care.

Overnight observation was required for 29.5% patients.

Only 12% patients required admission for more than a day, main cause being time of surgery was at night or were from far off places and were unable to revisit for early physiotherapy.

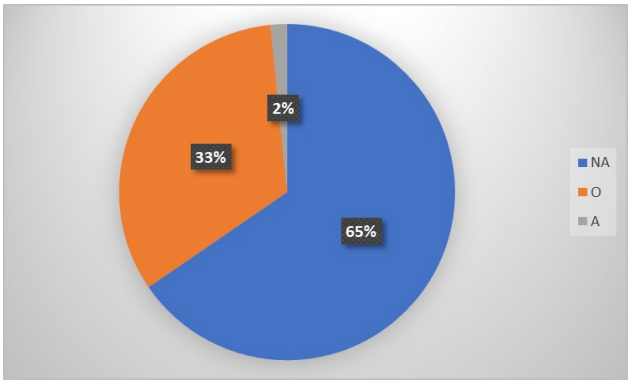


Fig. 3. Pie chart of patient Admission requirement

39.5% were pain-free post-operatively and did not require any kind of analgesics.33% had adequate pain relief using paracetamol tablet only. Only 7.5% patients required injectable analgesic either opioids or NSAIDs were used as needed. There were with multiple tendon and nerve repairs.

Table 6
Analgesic requirement

Analgesic	No. of patients
Nil(N)	79(39.5%)
Only paracetamol tab (PCM)	66(33%)
Aceclofenac tablet (AC)	40(20%)
Injectables (IV)	15(7.5%)

60 patients underwent tendon repairs or tendon transfers. On table disruption following tendon repair was seen in 20(33%) patients when they asked to move finger and was corrected immediately. This is an added advantage of WALANT surgery for tendon repair.

No complication was noted in 89% of cases indicating quick learning curve and safety of WALANT surgery. The most common was post-operative pain, seen in 8% patients which required iv analgesic. Other complications like vasovagal syncope, anxiety etc. were noted only in 4 patients (2%). Bleeding was noted in 2 patients (1%). None of the patients had any sign of fingertip necrosis. Abandonment of the procedure was not done in any patient.

Table 7
Complications

Complications	No. of Patients
None(N)	178(89%)
Pain(P)	16(8%)
Bleeding(B)	2(1%)
Others(O)	4(2%)

The mean score of immediate post-op Patient Satisfaction Questionnaire was 49.57 and for follow-up visits was 52.72.

The Median for immediate post-op was 51 and follow-up was 54.

The p-value was found to be (<0.05) for immediate post-op.

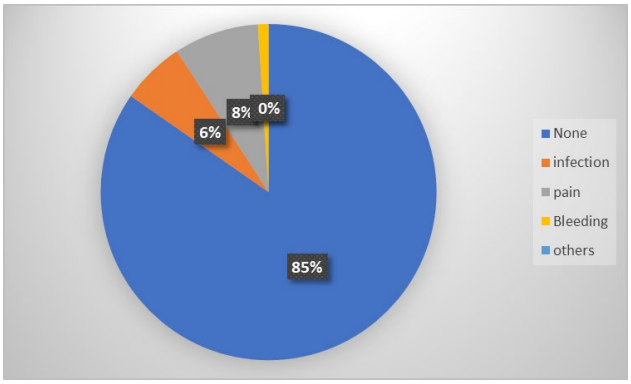


Fig. 4. Pie chart according to complications

Table 8
Patient satisfaction questionnaire

Score	IMMEDIATE POST-OP	FOLLOW-UP
0-20	0	0
20-40	23(11.5%)	0
40-55	177(88.5%)	200

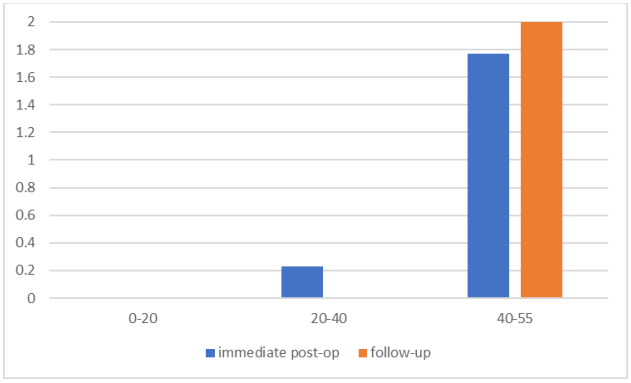
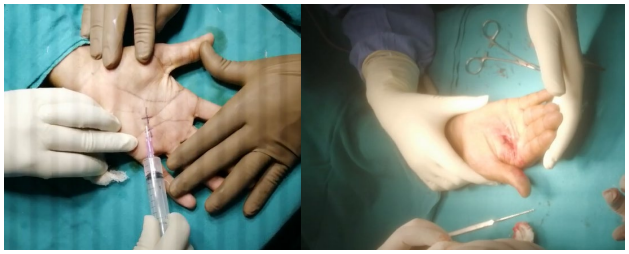


Fig. 5. Graph according to patient satisfaction questionnaire

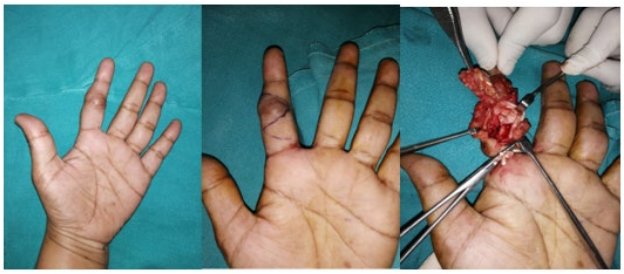
Of the 200 patients, 132(66%) patients underwent surgery in emergency setting without prior COVID testing. This allowed us to save time and also reduced the cost of surgery.

COVID testing was skipped only in patients who reported during the time where there was no COVID surge as per the state guidelines. Back up of anesthesia was available as per standard setting in all patients.

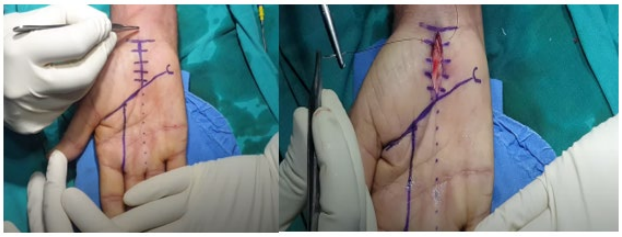
Clinical Photographs:



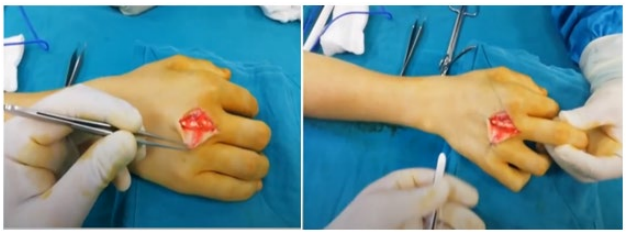
PATIENT 1: FDS REPAIR IN ZONE 4 INJURY



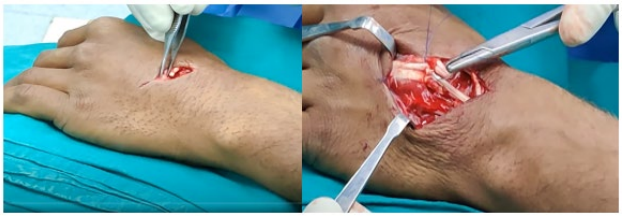
PATIENT 2: EXCISION OF GIANT CELL TUMOR OF MIDDLE PHALANX OF INDEX FINGER



PATIENT 3: CARPAL TUNNEL RELEASE

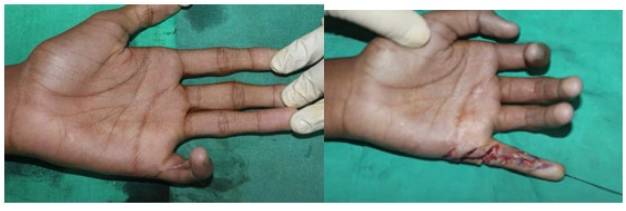


PATIENT 4: EXTENSOR DIGITORUM COMMUNIS REPAIR DONE

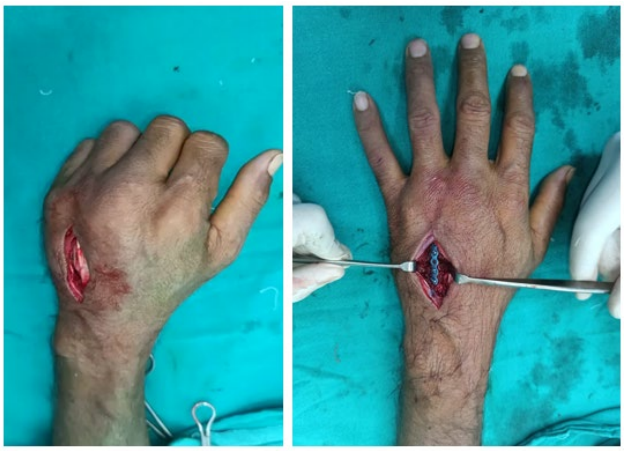


PATIENT 5: EXTENSOR DIGITORUM REPAIR DONE

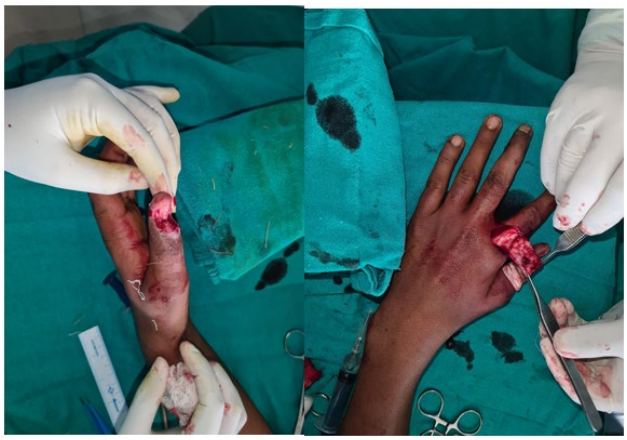
PATIENT 6: V-Y ADVANCEMENT FLAP FOR THUMB TIP AMPUTATION



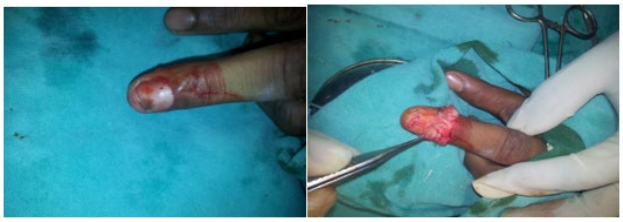
PATIENT 7: POST BURN CONTRACTURE RELEASE OF LITTLE FINGER



PATIENT 8: PLATE FIXATION FOR 4TH METACARPAL FRACTURE



PATIENT 9: CROSS FINGER FLAP DONE



PATIENT 10: GLOMUS TUMOR EXCISION

5. Discussion

Despite the safety of local anaesthetics combined with epinephrine being proven in the literature, widespread adoption of WALANT procedures has been slow due to multiple areas of resistance. Many of the procedures that may be performed under WALANT have been traditionally performed in a formal operating room in a hospital setting with GA or LAWT (Local Anaesthesia with Torniquet).

Furthermore, patient-specific factors have been brought into question, including their comfort with being awake for these procedures, their intraoperative and postoperative pain control, and postoperative functional outcomes.

In our study a total of 200 patients underwent day-care surgery under WALANT at Department of Plastic Surgery, Jawaharlal Nehru Medical College and Hospital, Aligarh Muslim University, Aligarh between Oct.2019 and Nov. 2021

after taking informed consent.

Patients of various complains were taken up for WALANT majority of them being of tendon injuries, visiting the casualty. Among routine surgeries, Carpal tunnel release was the most commonly performed surgery.

In a prospective cohort study by Davison et al, 100 consecutive carpal tunnel releases performed using the WALANT technique versus 100 consecutive carpal tunnel releases performed using LAWT with sedation were compared. Amongst these patients, preoperative anxiety levels were significantly lower among WALANT patients than among sedated patients. Furthermore, 93% of WALANT-treated patients reported that they would choose WALANT again, compared to 93% of patients who received sedation.

Similarly, Gunasagaran et al demonstrated that patients treated with WALANT had better perceived patient comfort scores (using visual analog scores) than those treated with LAWT without sedation. These results were further supported by Saleh et al's 2021 randomized control trial comparing patient discomfort in wide-awake carpal tunnel surgeries with or without tourniquet; patient discomfort was significantly higher in those treated with tourniquet than without. Additionally, there was no difference in patient anxiety before and immediately after surgery between groups. The 2021 study by Abd Hamid et al further supports this concept; in their randomized controlled study, 33 patients underwent WALANT and 32 patients underwent GA for ORIF of distal radius fractures. Between these 2 groups, there was no statistically significant difference in either the preoperative anxiety level or intra- and postoperative visual analogue scores. Such literature is in opposition to the perception that WALANT surgeries cause increased patient anxiety and discomfort. This may be due to the removal of fears surrounding intubation in GA or loss of consciousness or unawareness in the setting of sedation. Additionally, the discomfort inflicted by a tourniquet is eliminated in WALANT, further reducing a source of intraoperative discomfort and anxiety. Finally, there is possibly an element of demystifying the surgery and encouraging greater patient engagement in their care.

In our study 4 categories were created to divide patients in accordance to their comfort level during surgery, Category I (48.5%) being patient comfortable with no anxiety, and no complains regarding OT environment and staff behaviour. Category II (27%) being patient pain free but uncomfortable being aware of surgery being done. Category III (18%) patients felt pain during procedure. Category IV (6.5%) patients were anxious during procedure. 90 % of Category IV patients were females (p value<0.005).

Ayhan and Akaslan compared WALANT versus LAWT in 24 patients who had bilateral carpal tunnel releases: WALANT was used for 1 hand, and LAWT was used for the other. In total, 91.6% of patients reported that WALANT was an easier procedure than expected, as compared to 50% with LAWT. Furthermore, 83.3% of patient preferred WALANT over local anesthesia, and 91.6% found WALANT to be easier than a dental procedure. Similarly, Rhee et al's36 study at the military hospital investigating WALANT among patients undergoing carpal tunnel release showed that 94% of patients would choose WALANT again.

Postoperative pain is equivalent or better controlled with WALANT surgery than with GA or LAWT with or without sedation. Chapman et al prospectively evaluated postoperative opioid usage in patients who underwent carpal tunnel release under WALANT versus under LAWT with sedation. They found that there was no statistically significant difference in opioid usage between patients who underwent WALANT surgery (78 cases; 4.9 pills/case) versus LAWT with sedation (198 cases; 3.9pills/case). Most of the patients in our study were pain-free post-operatively and did not require any kind of analgesics. One-third of our patients had adequate pain relief using paracetamol tablet only. Only few patients required injectable analgesic either opioids or NSAIDs were used as needed.

Kang et al also examined opioid usage among patients who underwent WALANT versus GA versus LAWT. In this retrospective review, 20 patients underwent cubital tunnel release under WALANT versus 22 under GA protocols. Additionally, 20 patients underwent carpal tunnel release under WALANT versus 22 under LAWT and 20 under GA. Postoperative pain was statistically lower in the WALANT group in both open cubital tunnel and carpal tunnel surgeries as compared to the other methods of anesthesia, as represented by reduced postoperative opioid usage. Dar et al27 further demonstrated the reduced lack of need for postoperative opioid usage in WALANT cases in their prospective cohort study, which found that only 2 of 94 patients (2.1%) sought out opioids from outside providers after undergoing WALANT cases, versus 20% of patients who underwent the same procedures under LAWT with sedation. In addition, WALANT patients had significant less pain than LAWT patients with sedation, with or without the use of opioids ($P < .0001$)

According to a study conducted by Celik et al on 499 patients undergoing surgery of different modalities and anesthesia they found a negative significant correlation between the age and desire for information sub-scores ($r: -0.241$; $p = 0.001$). They found that the scores of graduates of university and higher were statistically significant than the primary school graduates ($p = 0.003$) and secondary school graduates ($p = 0.034$). Anxiety sub-scores of the patients who underwent general anesthesia were found to be significantly higher than the patients who underwent regional anesthesia ($p = 0.029$). Anxiety sub-scores of females were found to be significantly higher than the males ($p = 0.001$). In our study, we found level of anxiety to be significantly higher among females than males. Since education status of patients was not included in our study criteria, it cannot be commented upon.

Turcotte et al discussed 16 patients who safely underwent WALANT hand procedures during the height of the COVID-19 pandemic without complications. Additionally, Kurtzman et al reported on 72 patients who underwent WALANT procedures during the COVID-19 pandemic in New York City, also without complications. These papers demonstrate that WALANT surgery provides a safe alternative for orthopedic hand procedures in periods of limited resources or when main

operating rooms are closed and ventilatory support is reserved for those with greater needs. Additionally, WALANT avoids the aerosol generation from intubation that occurs when GA is administered, thereby reducing the risk of COVID-19 spread. In our study, 132 patients were operated in emergency setting with no prior COVID testing and had no complications related to it.

Complications specific to the WALANT anesthetic method are rare or have not been frequently reported, but include vasovagal syncope secondary to a patient becoming faint during the injection and "adrenaline rush" after epinephrine injection. This contrasts with the nausea and vomiting that may be experienced with GA, as well as the previously mentioned tourniquet-associated complications, such as postoperative nerve palsies, seen in LAWT. In a recent study conducted over 265 patients undergoing WALANT procedures with up to 22 mg/kg of lidocaine with 1:100,000 epinephrine being administered, there were no instances of local anesthetic systemic toxicity. Finally, a handful of studies reported digital ischemia; however, there was no finger loss in the setting of phentolamine reversal. The most common complication in our study was post-operative pain.

The standard upper extremity draping traditionally performed in a hospital or surgery centre operating room has been shown to be unnecessary for WALANT procedures, according to recent literature. Leblanc et al prospectively studied 1,504 consecutive carpal tunnel releases performed using WALANT over the course of 2 years across multiple centres. All cases used field sterility, as defined by preparing the hand with iodine or chlorhexidine, a single drape, and a sterile tray with limited instrumentation. Surgeons were not gowned, and no prophylactic antibiotics were administered. Sterile gloves and masks were worn. Among these cases, only 6 superficial infections (0.4%) and no deep infections were reported. None of the infections that occurred required further intervention other than oral antibiotics. These impressive results were supported by subsequent studies that involved more complex procedures performed using WALANT, including ORIF of distal radius fractures, repair of spaghetti wrist, and neve reconstructions.21,22,23,24 In a study by Avoricani et al, amongst 265 WALANT cases under field sterility (including 16 distal radius ORIF cases), there was a 0% rate of infections at 14 days after surgery and a 0.37% rate of infection at 30 days after surgery. This 1 case occurred in a delayed flexor tendon repair.

In Tahir et al's36 2020 study comparing ORIF of distal radius fractures performed under WALANT, general anesthesia, or Bier blocks, there were 2 complications in the GA group (attrition injury and mild local wound inflammation) and 3 complications in the Bier block group (tourniquet palsy and local anesthetic systemic toxicity). No complications were reported in the WALANT group. Similarly, in Maliha et al's retrospective review analyzing 76 trigger finger releases (39 under WALANT and 37 under LAWT with sedation or GA), there were no differences in intraoperative or postoperative complications between the 2 groups; both demonstrated similar rates of postoperative paresthesia (2.7% vs 2.7%), infection (0%), and recurrent triggering (5.13% vs 2.7%; P = .572).31 In a study by Reynolds et al36,424 patients who underwent WALANT hand surgery (trigger finger releases, first dorsal compartment releases, extensor tendon repairs, mass excisions, and carpal tunnel releases) were retrospectively reviewed, examining rates of complications after surgery. Amongst all procedures, the overall complication rate was 2.8%, and included 6 superficial infections treated with oral antibiotics, 2 deep infections requiring surgical incision and drainage, and 4 recurrences requiring reoperation. None of these complications were attributed to the use of WALANT or the use of local anesthesia with epinephrine.

These studies support the use of field sterility in WALANT surgery, as it is not associated with increased rates of infection when compared to standard sterile draping. This contributes to lower costs, reduces the need for storing bulky sterile draping packaging, and allows for allocation of such equipment to other procedures that require it. Additionally, it facilitates the ease of performing such operations outside of the traditional operation room setting.

The British Society for Surgery of the Hand (BSSH), British Association of Plastic, Reconstructive and Aesthetic Surgeons (BAPRAS) and affiliated societies have published COVID-19 specific guidelines that advocate managing hand fractures conservatively where possible, aiming to perform procedures under local anaesthetic or WALANT and aiming to follow up patients remotely to minimise outpatient visits.

Guiding principles included patients being assessed and operated on as part of a single healthcare encounter wherever possible. Procedures performed under WALANT. Staffing will be minimised. Personal Protective Equipment (PPE) in keeping with current UK guidelines will be worn by all staff to minimise potential spread of COVID-19.14 Patients attending appointments will also be advised to wear surgical face masks as per current UK guidelines. xix Where possible, physical follow up post discharge be minimised. The goal was a 'one stop surgical shop'. Three areas were required, run by a total of four staff members: two surgeons and two nursing staff.

Khor et al. compared the demand on the trauma service and compliance with guidelines on time to treatment during the COVID-19 pandemic lockdown period in 2019 and 2020 in UK. Data was collected retrospectively for the period of 1 April to 14 June 2019 from electronic patient records for all trauma patients undergoing surgery. Time from injury to treatment was calculated and benchmarked against the regional guidelines based on national guidelines for specific injuries. The time from injury to treatment was significantly less (2020 median = 2 days; 2019 median = 5 days; $p < 0.0001$). A greater proportion of patients were treated within 4 days from date of injury (2020 83%, N = 212;2019 47%, N = 179). In our study we found that in emergency setting WALANT surgery can be safely performed without COVID testing and helps in saving both time and cost. The BSSH guideline was easily performed alongside the routine procedures of the hospital as the number of OT personnel required was also less with WALANT.

6. Conclusion

The benefits of the WALANT approach include the following:

1. No sedation and no tourniquet increases patient comfort and convenience. Patients can have hand surgery in much the same way as a minor procedure at the dentist.
2. Eliminating the anesthesiology/sedation component decreases treatment time for minor procedures such as carpal tunnel and trigger finger releases.
3. During a procedure, the ability to see and alter sutured tendons and fixated bones and joints undergoing a full range of active movement initiated by a comfortable and cooperative patient has improved results in tendon repair, transfer, and finger fracture fixation.
4. A unique advantage of WALANT is that it decreases the risk of adhesion formation due to earlier active participation by the patient, which begins intraoperatively. Collagen formation begins on postoperative day three. It is a priority to begin supervised exercises after most hand procedures to prevent stiffness and adhesions. Prolonged immobilization causes tendons and soft tissue to adhere to the fracture callous and tendon sheaths, resulting in permanently stiff joints.

References

[1] Kurtzman, Joey S et al. “Wide-awake Local Anesthesia with No Tourniquet: An Updated Review.” Plastic and reconstructive surgery. Global open vol. 9,3 e3507. 26 Mar. 2021.