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Original Research

## Wide-Awake Hand Surgery Experience in Patients 10 to 18 Years of Age

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**Purpose:** We investigated the frequency of wide-awake local anesthesia no tourniquet (WALANT) use for hand surgery in the a 10- to 18-year-old age group and patients' experiences.

**Methods:** Patients aged 10–18 years who had hand surgery in June 2016 to March 2020 were identified. The frequency of patients who agreed to have surgery under WALANT was calculated (%). Patients who received WALANT over the previous year were interviewed for their surgical experiences.

**Results:** A total of 69 patients were identified, and 46 of them received WALANT. The mean age was 14.5 ± 2 years, and 22 of them were boys. Sixteen patients were called for a surgical experience assessment via questionnaire. They reported pain less than 1/10 during anesthesia injection and surgery. Ten patients (62%) found their operation easy, and 14 (87.5%) would prefer WALANT again.

**Conclusions:** This study showed that most patients in the 10–18 years age group accepted WALANT, and their surgical experiences were positive. For its advantages, WALANT should be considered in hand surgery for compliant patients in this age group.

**Type of study/level of evidence:** Therapeutic III.

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Wide-awake local anesthesia with no tourniquet (WALANT) is gaining significant popularity in hand surgery. In the forefront, intraoperative active movement testing and detailed patient education about the postoperative process are possible during surgery while the patient is totally awake.<sup>1</sup> Moreover, it eliminates the necessity of preoperative preparation for general anesthesia (GA), and the postoperative hospitalization period can be reduced from an overnight stay to 6 hours depending on the anesthesiologist's advice, thus decreasing the health service costs and workload.<sup>2,3</sup>

The selection of anesthesia technique to be used for surgery depends on 2 issues: the first is the surgeon's decision for medical purposes and the second is the patient's compliance and preference. Patient compliance before and during an operation with local anesthesia is a prominent dimension of this decision making. Additionally, the patient's experience of the operation while he or she is totally awake also emerges as an important issue in the

preference of anesthesia technique. Previous studies on patient experiences regarding WALANT technique showed positive results.<sup>4–6</sup> These positive patient experience results of the WALANT technique seem to encourage surgeons to widely use WALANT in different patient populations. In this regard, the pediatric patient population can be considered as a special group. It is known that the WALANT technique is sometimes used in this age group; however, the number of studies reporting its use in patients under 18 years of age is small. Similarly, their operative experience under WALANT is a matter of question. In our clinical practice, we use WALANT for its benefits for patients under 18 years of age too. In this study, we report our experience using WALANT in patients aged 10–18 years. The aim of our study was to report the frequency of WALANT use for hand surgery in patient between 10 and 18 years of age, and to assess the patients' perceptions of the experience.

## Materials and Methods

This study was carried out in a hand surgery outpatient clinic. The study design was approved by the local ethics committee of Gazi University (registration number 2020-284). Verbal informed consent was obtained from all subjects before the study on the telephone. Written informed consent was also obtained later in the

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**Table 1**  
Surgical Procedures Eligible for WALANT With the Number of Patients Who Chose WALANT or GA

Surgical Procedure	Number of Patients Operated Under WALANT	Number of Patients Operated Under GA
Tendon repair	9	5
Open reduction and fixation for phalangeal or metacarpal fracture	6	9
Trigger finger	6	0
Tenolysis	5	4
Pulley reconstruction	5	2
Ganglion cyst excision	5	3
Foreign body excision	4	2
K-wire extraction	3	0
Tendon cyst excision	2	0
Tendon transfer	2	1
Hemangioma excision	1	1
Cubital tunnel release	1	0
Digital nerve and artery repair	1	0

first follow-up visit as the pandemic measures began to relatively relax.

### Patients and Data Collection

Surgical records of a single hand surgeon (E.A.) between June 2016 and March 2020 were retrieved. At the first step, patients between 10 and 18 years who underwent hand surgery were identified. At the second step, patients who were offered the WALANT technique for their operation were included in the study (Table 1). The algorithm of decision making to use WALANT in a pediatric patient, in addition to the details of this technique, are described below.

The algorithm of decision making in a patient under 18 years was managed by the surgeon (E.A.) in light of the literature. As a first step, he decides whether the diagnosis of the patient and the required surgical procedure are suitable for WALANT use. In decision making, 2 factors were taken into account: the patient's compliance and the anticipated surgery time. The surgeon thought that the children would not tolerate a longer surgical procedure, as they can feel bored and become incontinent. If the anticipated surgery duration is around 2 hours at maximum, he offers WALANT to the patient and parent(s) after detailed explanation of the technique. Finally, the patient undergoes hand surgery with the anesthesia technique they chose with their parent(s): WALANT or GA. The examples of eligible diagnoses for WALANT use, depending on the anticipated surgery duration, are given in Table 1, along with the similar number of cases that were performed under GA during that period.

The patients who underwent any kind of hand surgery under WALANT were included in a further analysis. The age and sex of each patient were recorded. Surgical notes were examined carefully, and the details of the surgical procedures were extracted for each patient. Postoperative follow-up records were also reviewed for any complications or any other interfering issues about the healing process.

For the second part of the study, the patients who had surgery under WALANT within the previous year were reached by telephone. Before the interview with the patient, 1 parent was informed about the study on the telephone. If the parent gave verbal consent for their child to participate in the study, then the explanation about the study and consenting steps were repeated for the patient as well. After consent from both the parent and the patient, a questionnaire was used to assess the patient's surgical experience (Table 2). If the patient had reached 18 years of age by the day of the telephone call, then only the patient gave consent and answered the questions. The telephone interviews were

performed by the first author (Z.T.), who did not take part in the treatment of the participants, to minimize the bias.

The questionnaire that was used to assess patients' perspectives about WALANT was published by Davison et al.<sup>6</sup> The questionnaire consists of 5 questions asking the patient's perioperative experience (Table 2). The first 2 questions ask the patients to score their pain levels during local anesthetic injection and during the surgery on a numerical rating scale consecutively. In the following questions, patients are asked to compare their operation to a dental procedure regarding its difficulty and their preoperative expected pain level. They were also asked whether they would prefer the WALANT technique for any possible future operation again.

### WALANT Use in Pediatric Population

To apply the WALANT technique in the pediatric population, we follow the instructions of Lalonde.<sup>7</sup> As he reported, the key to WALANT use in pediatric patients is to provide good local anesthesia with a skillful injection so that all they feel is the first sting of the needle. Before the anesthetic application, an explanation about the process is obligatory; thus, the child must be old enough to understand the explanation and to hold still while the first needle is inserted. This is why we offer the WALANT technique to patients above 10 years in our clinical practice. After explanation, if the child and parent feel that the child will be able to hold still and tolerate the stick of the needle in the hand, the operation with WALANT is possible. The communication skill of the surgeon is the key factor, as using a calm and soft voice and engaging the patient in the conversation is helpful. Besides a successful conversation, some technical tips are also important for minimal pain injection. Using a 27- or 30-gauge needle, talking to the patient during the first insertion, pressing on or pinching the skin while inserting the needle (to create sensory distraction in that area), stabilizing the syringe with 2 hands, injecting enough volume of tumescent local anesthetic in an antegrade fashion to plump up the skin, and observing the local anesthetic tumescence before advancing the needle distally make the preoperative anesthesia injection easier.<sup>8</sup>

Patients are supervised for 2 hours in the hospital after the end of the surgery for any potential complications. Patients and parents are also informed about the signs of digital ischemia and circulation problems before discharge and told when to apply to the emergency department in any case.

### Details of the Solution

We prepared a mixture containing 1% lidocaine and 1:100,000 epinephrine and added 1 mL of 8.4% sodium bicarbonate for every

**Table 2**

Questionnaire to Assess Patient's Perspective for the WALANT Use

1. How bad was the worst of your pain during anesthetic injection? Please assign a number between 0 and 10. (0 = no pain at all; 10 = worst pain imaginable)										
0	1	2	3	4	5	6	7	8	9	10

2. How bad was the worst of your surgical site pain? Please assign a number between 0 and 10. (0 = no pain at all; 10 = worst pain imaginable)										
0	1	2	3	4	5	6	7	8	9	10

3. How did the surgery compare to having a procedure done at the dentist? Please circle 1 option.

- More pain than a dental procedure
- The same pain as a dental procedure
- Less pain than a dental procedure
- I did not experience any dental procedure

4. The surgery was...

- Better than expected
- As expected
- Worse than expected

5. Would you prefer the same anesthesia method for the same surgery again?

- Yes
- No, I would prefer a different anesthesia method (fill in the blanks with the preferred method \_\_\_\_\_)

10 mg of 1% lidocaine to buffer the acidic pH of lidocaine.<sup>7</sup> If we had 0.5 mg/1 mL of epinephrine on hand, we added it into 25 mL of lidocaine 2%, 19 cc of 0.9% isotonic NaCl, and 5 mL of 8.4% sodium bicarbonate to obtain 50 mL of solution containing 1% lidocaine and 1:100,000 epinephrine. If we had 1 mg/1 mL of epinephrine on hand, we added it into 50 mL of lidocaine 2%, 39 cc of 0.9% isotonic NaCl, and 10 mL of 8.4% sodium bicarbonate to obtain 100 mL of solution containing 1% lidocaine and 1:100,000 epinephrine. For all cases, we sucked the required dose into a syringe from the solution. We never exceeded the maximal dose of 7 mg/kg; that is, 490 mg or 49 mL of 1% (10 mg/mL) lidocaine with 1:100,000 epinephrine in a 70-kg patient.

### Statistical Analysis

The rate of WALANT use for hand surgery among the patients under 18 to whom it was offered was given as a numerical value (%). Ages of the patients with WALANT were given as the mean  $\pm$  SD and sex distribution was given in numbers (%). The surgery types were described and given in numbers (n). The results of the patient experience questionnaires were also given as numerical values (%) for multiple-choice comparative questions and as the mean  $\pm$  SD for the questions with numeric ratings.

### Results

A total of 69 patients who considered having their surgical procedures done under

WALANT were identified. Of those, 46 (67%) patients chose to undergo surgery with the WALANT technique, while 23 (33%) of the patients chose GA. The average age of the patients with WALANT was  $14.84 \pm 2.09$  years, and 22 of them were boys (48%). The patients with GA (n = 23) were similar to the WALANT group regarding age ( $14.08 \pm 2.02$  years;  $P = 0.15$ ) and sex distribution (n = 35% boys;  $P = 0.30$ ).

The surgical procedures that are eligible for WALANT use are given in Table 1. In addition, the numbers of patients who received WALANT or GA for surgery are also given. A total of 50 surgical procedures were performed under WALANT in 46 patients. Four patients in this group had more than 1 procedure in the same session. The most common surgical procedure performed was tendon repair, in 9 patients, followed by flexor tendon repairs in 5 patients and extensors in 4 patients. Twenty-three patients who

received GA for surgery had a total of 27 procedures (Table 1). Only 1 patient (13-year-old girl) who required flexor tendon tenolysis could not tolerate the local anesthesia and had her surgery under GA later. There were no complications in the immediate post-operative period.

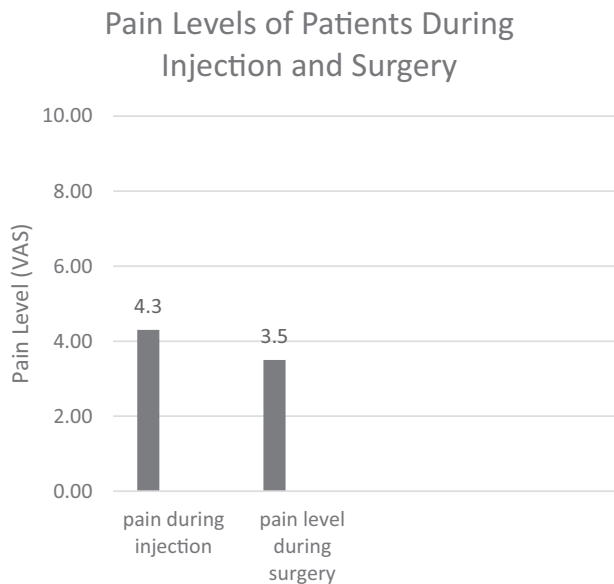
In the WALANT group, 16 of the patients had surgery over the previous year and were called for an assessment of the patient's perspective. We could reach all the patients by telephone and interviewed them through the questions in Table 2. At the time of the telephone call, the time range after the surgery was 1–12 months. Only 3 patients reported pain during local anesthesia injection, with an average of 4.3/10 points. The rest of the patients felt no pain during injection. The overall average pain level during injection in the group (n = 16) was 0.8/10 points. In the assessment of pain level during surgery, only 2 patients reported pain, with an average of 3.5/10. The rest of the patients felt no pain during the surgery. The overall average pain level during surgery in the group was 0.4/10 points (n = 16) (Fig.).

Ten of 16 patients (62.5%) reported that their operation was less painful than a dental treatment and easier than they expected preoperatively. Fourteen patients (87.5%) expressed that they would prefer WALANT technique again for any possible future hand surgery.

### Discussion

It is known that patients under 18 years of age undergo hand surgery with the WALANT technique; however, the reports on the subject have been limited. This study showed that most of the patients between 10 and 18 years who had been offered WALANT technique for their operation preferred it. Additionally, a subgroup of those patients reported that they are happy with their hand surgery experience under WALANT. Also, similar to previous studies that have showed that use of epinephrine in the hand is actually safe, contrary to classic teachings that warned of digital necrosis if epinephrine was used for a digital block, we also saw no complications after surgery. Specifically, we saw no vascular complications from our use of lidocaine with epinephrine.

Similar to all other surgical procedures in the pediatric population, hand surgery also almost globally requires the use of GA. Before the scheduled surgery under GA, it has to be confirmed that the patient can safely receive the anesthetics through pediatric and anesthesiology consultations. It is obligatory to obtain the



**Figure.** Pain levels of the patients who felt pain during local anesthetic injection (n = 3) and during surgery (n = 2). VAS, visual analog scale.

confirmation, as GA has its own risks and possible long-term side effects.<sup>9</sup> However, surgery occasionally has to be postponed, as patients in the pediatric population are relatively more vulnerable to upper respiratory tract infections. Patients were reported to wait an average of 1 month until the next appointment in some cases.<sup>10</sup> Besides, repeat tests of blood and radiography are sometimes necessary.<sup>10</sup> Thereby, all those repeat preparations result in a delay and increase the health care costs. When it comes to the surgery day, overnight fasting of at least 6–8 hours is required to reduce the risk of pulmonary aspiration of gastric contents during GA. It is an additional stressing issue for younger patients, as both hunger and thirst make it more difficult to wait in the preoperation room.<sup>11</sup> Some parents also appear to be anxious about the surgical risks and concerned about the potential future problems related to GA.<sup>12</sup> For all those reasons, WALANT is considered to be an alternative instead of GA for the patients with an appropriate diagnosis. Increasing use of the WALANT technique for hand surgery depends on its favorable benefits compared to GA. It eliminates the necessity of preoperative preparation and postoperative hospitalization.<sup>13</sup> Moreover, in any case of postponing surgery due to a preoperative infection, the preoperative basics would be performed again for GA. Therefore, WALANT use decreases the health care service workload and costs. The additional costs to the parents, such as travel, food, and parking fee expenses, can also be reduced. In addition, especially for patients under 18 years old, a shorter time spent in the hospital would decrease the time away from the school, while their parents can also return to work earlier. In our study, all surgeries were daycare procedures; thus, patients and their families also benefited from the cost-decreasing and time-saving effects of WALANT method. For all those benefits above, we offer the WALANT technique for hand surgery in patients below 18 years when possible. With this study, we showed that most of the patients prefer WALANT and would prefer it for reoperations. Similar to our results, a recent study showed that adult patients who underwent bilateral carpal tunnel release found their operation under WALANT easier than a dental treatment, and most of them would prefer WALANT again, but not intravenous regional anesthesia, for any possible future operations.<sup>5</sup> These positive

results of patients' perspective assessments have a prominent importance. As the health care givers, we prefer the WALANT technique for its benefits; nonetheless, the results of this study showed that patients also prefer it and are happy with their WALANT experience.<sup>3</sup> It is reassuring and gratifying to see that not only we but also our patients found it advantageous. Only 3 patients reported pain during anesthetic injection and 2 patients reported pain during surgery. We think that following the instructions for WALANT did help us to minimize the pain levels.<sup>7</sup> To explain, we use a fine needle (27 or 30 gauge) for anesthetic injection, squeeze the skin of the area to be injected before and during the injection, and administer our injection proximal to distal. We are also aware that assessing the patients a while after surgery could cause a recall bias, which might lead to more patients reporting no pain. Therefore, to minimize the risk of recall bias, we assessed only the patients who had surgery within the previous year. In addition, we asked the patients on the phone whether they remembered the surgery day before starting the assessment. All patients expressed that they remember the day and the surgery details, and then we completed the assessment.

Hand surgery covers both congenital and acquired conditions. Congenital conditions mostly require intervention at younger ages and the use of GA due to the inability of the patients to cooperate with regional or local anesthesia. Therefore, the majority of our patients had surgery for traumatic conditions. Also, we included only patients above 10 years old in the study, as we consider that this age is a threshold for communication skills and patient compliance. We felt children at this age could personally give perspectives on their experience with hand surgery.

Widespread use of the WALANT technique is being reported in hand surgery for various patient populations.<sup>14–19</sup> While this study appears to be the first report of WALANT use in patients below 18 years, it is not without limitations. Firstly, the operative experiences of patients that received WALANT were not compared to perspectives of those who received GA for hand surgery. This may be a good option for future studies in pediatric populations. Secondly, we had to set a threshold age of 10 years, as younger patients mostly had surgery under GA. Patient compliance during surgery is among the most important issues for local anesthesia, and younger patients may not tolerate local anesthesia even for simple interventions. Likewise, 1 of our patients of 13 years could not tolerate tenolysis surgery under WALANT, and she had to have surgery under GA later. Thirdly, our sample size in the second part of the study is relatively small, because we called only the patients who were operated over the previous year in an effort to minimize the recall bias. Finally, patients replied to the questions verbally on the phone instead of completing an anonymous form during their clinic visit. Indeed, we thought that they would feel more comfortable when they were not face-to-face with their medical team in the clinic.

Although we had only 1 patient with a conversion to GA, we felt we could draw some conclusions from that 1 case. First, if the patient looks anxious in the preoperative room on the surgery day, the operation can be delayed to another time with the use of GA. We can conclude based on our study that the WALANT technique is advantageous for certain pediatric patients. The patient's ability to comply during anesthesia and surgery is the key factor in the success of this technique. The surgeon should be aware of the patient's preoperative anxiety with careful communication and avoid insisting on using WALANT.

In conclusion, the results of this study showed that the WALANT technique should be considered for hand surgery in suitable patients between 10 and 18 years. Not only health professionals but also patients and parents prefer it for its prominent benefits.

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