Journal of Hand Surgery Global Online 3 (2021) 129–132

Contents lists available at ScienceDirect

Journal of Hand Surgery Global Online

journal homepage: www.JHSGO.org

Original Research

Open Carpal Tunnel Release Under WALANT – Suitable for All Ages?

Laura Lech, MD, [*] Sebastian Leitsch, MD, [†] Christian Krug, MD, [†] Mario Bonaccio, MD, [†] Elisabeth Haas, MD, [‡] Thomas Holzbach, MD, PhD [†]

[*] Department of General, Visceral, Transplantation, Vascular and Paediatric Surgery, University Hospital Wuerzburg, Wuerzburg, Germany
[†] Department of Hand and Plastic Surgery, Spital Thurgau, Frauenfeld, Switzerland
[‡] Division of Hand-, Plastic and Aesthetic Surgery, Ludwig-Maximilians-Universität, Munich, Germany

ARTICLE INFO

Article history:
Received for publication November 23, 2020
Accepted in revised form February 10, 2021
Available online March 24, 2021

Key words:
WALANT
IVRA
Open carpal tunnel release
Patient satisfaction
Sarcopenia

Purpose: Wide-awake local anesthesia with no tourniquet (WALANT) as a walk-in procedure has become a standard technique in open carpal tunnel release (OCTR) and continues to replace the long-established intravenous regional anesthesia with a tourniquet (IVRA/"bier-block") in our clinic. The aim of this study was to compare patient satisfaction with either WALANT or IVRA/"bier-block" and define subgroups that are particularly suited for either of the two procedures. We hypothesized that older patients would prefer IVRA because of a shorter period of postoperative surveillance.
Methods: In this retrospective study we evaluated patient satisfaction with either WALANT or IVRA using an adjusted questionnaire on a standard Swiss grading system (from 1 = insufficient/very strong pain to 6 = excellent/no pain). Secondary outcomes included postoperative pain or satisfaction with the tourniquet and quality of postoperative care.
Results: For the 176 patients (WALANT, n = 109; IVRA, n = 67) included in the study, there was high patient satisfaction with both procedures (WALANT, 5.5/6; IVRA, 5.5/6). Patients aged 80 years and older had significantly less postoperative pain after WALANT (WALANT, 5.8/6 vs IVRA, 4.9/6).
Conclusions: Patients aged 80 years and older had significantly less postoperative pain after WALANT than that after IVRA. Here, sarcopenia may have contributed to the prolonged discomfort after tourniquet application. Immediate postoperative discharge after WALANT did not negatively affect older patients.
Clinical relevance: For OCTR, WALANT as a walk-in procedure is a safe and comfortable alternative to IVRA, which is commonly planned with short postoperative surveillance. Both anesthesia techniques are suitable for all ages and sexes but based on this study we recommend WALANT as a tourniquet-free operation in older patients.

Carpal tunnel syndrome (CTS) is one of the most common diseases of the hand with increasing prevalence and incidence over recent years.[1] Women are more likely to have CTS than men, and the median age of patients has increased over time. Most patients who develop CTS are between 50 and 60 years of age.[2] Today, open carpal tunnel release (OCTR) is frequently performed sedation-free and without a tourniquet using the wide-awake local anesthesia with no tourniquet (WALANT) technique. Several studies have shown less intraoperative pain using the WALANT technique compared with the anesthesia procedures that use a tourniquet.[3–7] Further benefits of WALANT include intraoperative communication with the patient, the absence of postoperative nausea and vomiting, the opportunity to eat and drink before surgery, and the ability to provide one's own transportation to and from surgery in an ambulatory setting.[4,8,9] Intraoperative testing of active movement is another advantage of WALANT, although it plays a greater role in procedures such as tendinous repairs, joint artholysis, and osteosynthesis. WALANT seems to be a comfortable, fast, and flexible anesthesia technique without a long period of postoperative monitoring. Thus, we hypothesized that WALANT is better suited to younger, working, and physically healthy patients.

Declaration of interests: No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Corresponding author: Laura Lech, MD, Sanderstrasse 35, Wuerzburg 97070, Germany.
E-mail address: laura-lech@gmx.de (L. Lech).

https://doi.org/10.1016/j.jhsg.2021.02.002

Material and Methods

Until 2018, most OCTRs in our clinic were performed under intravenous regional anesthesia with a tourniquet (IVRA/"bier-block"). In 2018, we progressively, but not exclusively, switched to the WALANT technique. OCTR under WALANT is planned as a walk-in procedure with immediate discharge out of the operating room. After IVRA, a short period of postoperative surveillance in our outpatient clinic is standard.

Patient selection

In our retrospective study, we included 400 patients over 18 years of age who underwent elective OCTR under either WALANT (n = 200) or IVRA (n = 200) between 2016 and 2019 in our 2 Swiss cantonal hospitals. We excluded OCTR with concomitant procedures, such as trigger finger release and OCTR performed under sedation. Surgeries were performed by a number of surgeons but in the same manner and under the supervision of a senior specialist in hand surgery. We performed standardized WALANT anesthesia using a 1% lidocaine-epinephrine mixture. The injection was performed the same way each time and as described in the literature.[4,8] Our anesthesiologists also performed a standardized IVRA anesthesia using 0.75% prilocaine and with the tourniquet always placed on the upper arm. Patients who required sedation in addition to the IVRA or WALANT anesthesia were excluded. The anesthesia procedure to be performed was chosen on the basis of the time and place of the procedure. As of 2018, we primarily used the WALANT technique in one of the 2 hospitals because of newer facilities. We successively made the transfer toward WALANT in the other hospital.

Measurement/Instrument

A customized questionnaire was sent to 400 patients. The Swiss school grading system (Table 1) was used for assessment.[10] Our primary outcome measure was patient satisfaction with the anesthesia procedure. The secondary outcome measures were satisfaction with OCTR, intra- and postoperative pain, perception of the injection, satisfaction with the tourniquet during the IVRA procedure, and quality of postoperative care. For postoperative satisfaction, we were particularly interested in whether there were differences between immediate discharge and postoperative surveillance. Patients were asked to state whether they contacted a doctor owing to a postoperative complaint. This study was approved by the clinic's review board. Informed consent following Health Insurance Portability and Accountability Act regulations was obtained from all patients.

Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics version 24 software. Unpaired Student *t* tests were used to detect statistically significant differences between the WALANT and IVRA groups. Our primary null hypothesis was that there is no difference in patient satisfaction between WALANT and IVRA anesthesia for OCTR. To determine a sufficient sample size, we evaluated routinely performed follow-up inquiries to obtain a sigma concerning the primary outcome. A *P* value of equal to or less than 5% ($P \leq .05$) was considered significant.

The secondary null hypothesis of this study was that patient's age did not affect the satisfaction with WALANT. We matched different subgroups based on age to evaluate whether WALANT is equally suited to all ages.

Table 1
Explanation for the Swiss School Grading System Used in our Questionnaire

1	Insufficient; is not true at all; very strong pain
2	Deficient; rather does not apply; strong pain
3	Sufficient; is partly true; moderate pain
4	Satisfying; is more true; tolerable pain
5	Good; is true; less pain
6	Excellent; is fully true; no pain

Table 2
Patients' Demographics

Demographics	WALANT	IVRA
Overall patients (n)	109	67
Women, n (%)	66 (60.6%)	41 (61.2%)
Men, n (%)	43 (39.4%)	26 (38.8%)
Mean age (SD)	63.7 (15.3)	63.9 (16.2)
Patients ≤ 40 years (n)	7	6
Patients ≥ 65 years (n)	46	36
Patients ≥ 80 years (n)	17	13

Table 3
Patient Satisfaction with Anesthesia Procedure (Mean Grade, *P* Value)

Patient	WALANT (Mean Grade (SD))	IVRA (Mean Grade (SD))	*P* Value
Overall	5.5 (0.9)	5.5 (0.8)	.78
Women	5.5 (0.9)	5.5 (0.8)	.87
Men	5.4 (1.0)	5.5 (0.7)	.79
Patients ≥ 80 years	5.9 (0.2)	5.7 (0.6)	.38

Results

Of 400 questionnaires sent out to patients meeting the inclusion criteria (WALANT, n = 200; IVRA, n = 200), we could include 176 completed questionnaires (WALANT, n = 109; IVRA, n = 67) in our study. Because of the unequal number of subjects in the 2 groups, an ordinary 1:1 matching was not possible. However, sex, age, and co-morbidities were matchable across both study groups (Table 2). The mean age of patients was 63 years with half of the patients aged more than 65 years and 30 patients aged 80 years and older.

Both anesthesia procedures (WALANT and IVRA) were correlated with high overall satisfaction, and there was no significant difference between them (WALANT, 5.5/6 vs IVRA, 5.5/6; $P = .78$). The sex of the patient, when considered independently from age, had no significant effect on satisfaction (Table 3). Patients aged 80 years and older were equally satisfied with WALANT and IVRA (WALANT, 5.9/6 vs IVRA, 5.7/6; $P = .38$). OCTR was also correlated with high satisfaction regardless of anesthesia (overall score: WALANT, 5.4/6 vs IVRA, 5.5/6; $P = .26$, and patients aged ≥ 80 years: WALANT, 5.8 vs IVRA, 5.7; $P = .14$).

Both intraoperative (WALANT, 5.9/6 vs IVRA, 5.8/6; $P = .53$) and postoperative pain (WALANT, 5.1/6 vs IVRA, 5.3/6; $P = .19$) were perceived as very tolerable for both procedures. Patients aged 80 years and older reported significantly less postoperative pain after WALANT than that after IVRA, resulting in a higher score (WALANT, 5.8/6 vs IVRA, 4.9/6; $P = .05$) and thus rejecting our secondary null hypothesis (Fig.). Men complained of significantly higher postoperative pain, resulting in a lower score with WALANT (WALANT, 4.9/6 vs IVRA, 5.5/6; $P = .01$).

The injection of the anesthetic was perceived as tolerable for both techniques (overall score: WALANT, 5.0/6 vs IVRA, 5.3/6; $P = .11$, and patients aged ≥ 80 years: WALANT, 5.5/6 vs IVRA, 5.5/6; $P = .92$). During the IVRA procedure, the tourniquet was, in general,

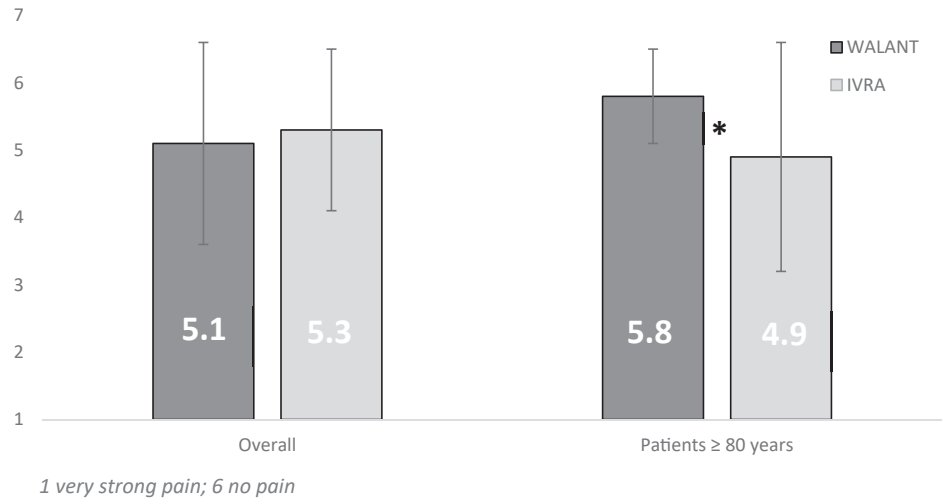

Figure. Postoperative pain (mean grade, *P value $\leq$ .05). The figure describe the mean grade of postoperative pain after WALANT or IVRA anesthesia for all patients (overall) and for patients aged 80 years and older.

rated as passably tolerable (overall score, 5.0/6; patients aged $\geq$ 80 years, 4.7/6). The use of a tourniquet was perceived similarly regardless of sex and age (overall score: women, 4.7/6 vs men, 5.3/6; P = .06, and patients aged $\geq$ 80 years: women, 5.2/6 vs men, 4.0/6; P = .28).

After both modes of anesthesia, there was high satisfaction with the postoperative care (overall: WALANT, 5.3/6 vs IVRA, 5.2/6; P = .53, and patients aged $\geq$ 80 years: WALANT, 5.8/6 vs IVRA, 5.3/6; P = .05). After the WALANT procedure, there were significantly more unscheduled consultations due to postoperative complaints (WALANT, 13.8% [n = 15] vs IVRA, 4.5% [n = 3]; P = .03). The reasons for unscheduled consultations were postoperative pain (WALANT, n = 8; IVRA, n = 3) or unspecific questions regarding the postoperative course (WALANT, n = 4). After the WALANT procedure, only one patient visited a doctor because of minor bleeding. Among patients aged 80 years and older, one patient visited a doctor after WALANT and one after IVRA.

Discussion

The rising median age of patients with CTS was reflected in our data. Half of the patients in the study were over 65 years of age, with 30 of them being $\geq$ 80 years old. Because of the aging population, we hypothesized that the WALANT procedure without postoperative surveillance, as is standard in our WALANT regime, could negatively impact older patients and result in them preferring the IVRA procedure. However, the results of this study disproved our hypothesis. The patients aged 80 years and older were very satisfied with both methods (Table 3). After the WALANT technique, the older patients had significantly less postoperative pain than that after the IVRA procedure (Fig). In previous studies, WALANT was also associated with significantly lower intraoperative pain and discomfort than local anesthesia with a tourniquet.[3,5,6,11] The patients in those studies blamed the tourniquet for their discomfort.

Sarcopenia is found in as many as 50% of those over 80 years of age.[12,13] We did not assess the degree of sarcopenia in our patients, but we perceive a comparable distribution in our patient population. Therefore, we reasonably assume that sarcopenia may contribute to the tourniquet discomfort of these patients. The quality of aging muscle decreases not only with the loss of muscle mass but also with the infiltration of fat and connective tissue.[14] These older muscles are more easily fatigued and associated with high frailty. Furthermore, their recovery after injury or ischemia (eg, due to a tourniquet) is delayed and frequently incomplete.[15] Recent studies could not find significant differences in intraoperative blood loss and complication rates with or without a tourniquet during anesthesia.[5,16] Thus, we would rather recommend a tourniquet-free operation for elderly, frail patients. Contrary to our expectations, immediate discharge from the operating room did not negatively impact the older patients. They were very satisfied with the short length of stay in the hospital and the WALANT procedure in general.

Regarding overall satisfaction with OCTR, our data correlated with the outcomes of previous studies, which described OCTR as a safe procedure with low complication rates and high patient satisfaction.[17–19] In contrast to other studies, our patients were equally satisfied with both anesthesia procedures, with and without a tourniquet (Table 3). Thus, the discomfort under a tourniquet mentioned in other studies could not be substantiated based on our data. Although women felt slightly more discomfort than men (women, 4.7/6; men, 5.3/6; P = .06), there was a high level of tourniquet acceptance among all patients. In the present study, patients also reported less to no intra- and postoperative pain under either technique. Whereas patients in the study conducted by Lied et al[20] reported the injection of anesthetic as the most uncomfortable part of the WALANT procedure, our patients tolerated the injections well. Pires Neto et al[21] mentioned that most of those who can undergo dental treatment under local anesthesia can also have their hands operated on using sedation-free procedures.

However, it was striking that significantly more patients visited a doctor postoperatively with complaints after WALANT, especially because of postoperative pain or with questions. This could possibly be due to the immediate discharge from the operating room in our WALANT regime. During postoperative surveillance (eg, under IVRA), patients are visited by the surgeon at least once before being discharged. Thus, they have the possibility to ask questions and discuss complaints. A quick wound check before discharge probably contributes to the patient's well-being. For this reason, we think that WALANT may be less suitable for more anxious patients. These patients would certainly benefit from a postoperative surveillance as well as a postoperative handout with the most important information. Further research would help determine whether a short postoperative monitoring period after WALANT reduces emergency consultations and is associated with a

higher patient satisfaction than that of our current walk-in and walk-out concept for OCTR under WALANT.

Several limitations must be considered in the present study. First, it is not a comparative prospective study but a retrospective, observational, single-center study that was performed at 2 cantonal hospitals. In addition to this, we have to notice the low response rate of 44% (176 of 400 questionnaires). The response rate in the WALANT group was higher than that in the IVRA group (WALANT, n = 109 vs IVRA, n = 67). Most of the interventions under IVRA were conducted before 2018. Thus, the time between OCTR and subsequent survey was longer than that in the WALANT group where we sent out the questionnaires as a follow-up in a more timely fashion. This could explain the lower feedback from the IVRA group, as many of them were not able to remember every detail and therefore did not answer all the questions; hence more questionnaires had to be excluded because of noncompletion. Nevertheless, we feel that the questions were simple enough to be answered a few weeks, or even months, after the operation. This presumption is supported by the quality of the completed questionnaires in both groups, which was similar. Again, the power of the statistical analysis is sufficient to support our findings.

In addition, most of the data collected in the study were of a subjective nature. Commonly, patients experience satisfaction, pain, or discomfort differently. As with every follow-up interrogation, there is either a bias toward very satisfied or very unsatisfied patients. Also, patients sometimes confuse whether they were satisfied with the result of the operation or with the type of anesthesia. We tried to reduce this uncertainty by asking specific and simple questions and applying the standard Swiss grading system (from 1 = insufficient/very strong pain to 6 = excellent/no pain) for simplicity. In our study, we could demonstrate that OCTR under WALANT is suitable for all age groups. Patients aged 80 years and older were even happier with WALANT anesthesia and reported significantly less postoperative pain when compared with IVRA/"bier-block." Since sarcopenia may contribute to prolonged discomfort after tourniquet application, we would recommend WALANT in older patients.

References

1. Burton CL, Chen Y, Chesterton LS, van der Windt DA. Trends in the prevalence, incidence and surgical management of carpal tunnel syndrome between 1993 and 2013: an observational analysis of UK primary care records. *BMJ Open*. 2018;8(6):e020166.
2. Newington L, Brooks C, Warwick D, Adams J, Walker-Bone K. Return to work after carpal tunnel release surgery: a qualitative interview study. *BMC Musculoskelet Disord*. 2019;20(1):242. https://doi.org/10.1186/s12891-019-2638-5.
3. Iqbal HJ, Doorgakant A, Rehmatullah NNT, Ramavath AL, Pidikiti P, Lipscombe S. Pain and outcomes of carpal tunnel release under local anaesthetic with or without a tourniquet: a randomized controlled trial. *J Hand Surg Eur Vol*. 2018;43(8):808–812.
4. Kaiser P, Keller M, Dörler J, Schmidle G. Wide-awake-Technik in der Handchirurgie anhand von Anwendungsbeispielen. *Oper Orthop Traumatol*. 2018;30(3):195–209.
5. Sasor SE, Cook JA, Duquette SP, et al. Tourniquet use in wide-awake carpal tunnel release. *Hand (N Y)*. 2020;15(1):59–63. https://doi.org/10.1177/1558944718787853.
6. Maury AC, Roy WS. A prospective, randomized, controlled trial of forearm versus upper arm tourniquet tolerance. *J Hand Surg Br*. 2002;27(4):359–360.
7. Baguneid MS, Sochart DH, Dunlop D, Kenny NW. Carpal tunnel decompression under local anaesthetic and tourniquet control. *J Hand Surg Br*. 1997;22(3):322–324.
8. Lalonde DH. Latest advances in wide awake hand surgery. *Hand Clin*. 2019;35(1):1–6.
9. Codding JL, Bhat SB, Ilyas AM. An economic analysis of MAC versus WALANT: a trigger finger release surgery case study. *Hand (N Y)*. 2017;12(4):348–351.
10. Bodenmann PS. The Educational System of Switzerland. Education around the World. *Office of Education (DHFW), Washington, D.C.* 1980;36
11. Gunasagaran J, Sean ES, Shivdas S, Amir S, Ahmad TS. Perceived comfort during minor hand surgeries with wide awake local anaesthesia no tourniquet (WALANT) versus local anaesthesia (LA)/tourniquet. *J Orthop Surg (Hong Kong)*. 2017;25(3):2309499017739499.
12. Baumgartner RN, Koehler KM, Gallagher D, et al. Epidemiology of sarcopenia among the elderly in New Mexico. *Am J Epidemiol*. 1998;147(8):755–763.
13. Santilli V, Bernetti A, Mangone M, Paoloni M. Clinical definition of sarcopenia. *Clin Cases Miner Bone Metab*. 2014;11(3):177–180.
14. Ryall JG, Schertzer JD, Lynch GS. Cellular and molecular mechanisms underlying age-related skeletal muscle wasting and weakness. *Biogerontology*. 2008;9(4):213–228.
15. Snijders T, Verdijk LB, Smeets JS, et al. The skeletal muscle satellite cell response to a single bout of resistance-type exercise is delayed with aging in men. *Age (Dordr)*. 2014;36(4):9699. https://doi.org/10.1007/s11357-014-9699-z.
16. Bidwai AS, Benjamin-Laing HE, Shaw DA, Iqbal S, Jones WA, Brown DJ. Patient satisfaction with tourniquet application and local anaesthesia infiltration in carpal tunnel decompression and the relationship with overall satisfaction. *J Plast Surg Hand Surg*. 2013;47(6):481–483.
17. Via GG, Esterle AR, Awan HM, Jain SA, Goyal KS. Comparison of local-only anesthesia versus sedation in patients undergoing staged bilateral carpal tunnel release: a randomized trial. *Hand (N Y)*. 2020;15(6):785–792.
18. Becker SJ, Makanji HS, Ring D. Expected and actual improvement of symptoms with carpal tunnel release. *J Hand Surg Am*. 2012;37(7):1324–1329.e5.
19. Benson LS, Bare AA, Nagle DJ, Harder VS, Williams CS, Visotsky JL. Complications of endoscopic and open carpal tunnel release. *Arthroscopy*. 2006;22(9):919–924.e2.
20. Lied L, Borchgrevink GE, Finsen V. Wide awake hand surgery. *J Hand Surg Asian Pac Vol*. 2017;22(3):292–296.
21. Pires Neto PJ, Moreira LA, Las Casas PP. Is it safe to use local anesthesia with adrenaline in hand surgery? WALANT technique. *Rev Bras Ortop*. 2017;52(4):383–389.