Journal of Hand Surgery Global Online 2 (2020) 13–15

Contents lists available at ScienceDirect

Journal of Hand Surgery Global Online

journal homepage: www.JHSGO.org

Original Research

Endoscopic Carpal Tunnel Release Using Wide-Awake Anesthesia

Thuan V. Ly, MD, * Vera Urban, MD, * Claudia Meuli-Simmen, MD, * Itai Pasternak, MD †

* Clinic for Hand, Plastic, and Peripheral Nerve Surgery, Kantonsspital Aarau, Aarau, Switzerland
† Spital Muri, Muri, Switzerland

ARTICLE INFO

Article history:
Received for publication December 30, 2018
Accepted in revised form October 30, 2019
Available online December 16, 2019

Key words:
Carpal tunnel syndrome
Endoscopic
Patient-reported outcome
Wide awake hand surgery

Purpose: We report on patient and surgeon experience after single-port endoscopic carpal tunnel release (CTR) using wide-awake local anesthesia no tourniquet (WALANT) technique.
Methods: From July to November 2018, patients undergoing endoscopic CTR with WALANT were prospectively included. Follow-up was 3 months. Patient ratings before, during, and after the operation were collected. We recorded the surgeon's experience during surgery compared with the endoscopic CTR under local anesthesia with exsanguination and tourniquet. Complications were defined as nerve injury, infection, or the need for revision surgery.
Results: The cohort consisted of 20 patients (24 wrists). All patients except one reported a complete or substantial decrease of symptoms. The 2 surgeons involved judged the procedure to be technically more demanding owing to impaired visualization (33%) caused by increased bleeding and edema in the operative field. There was one conversion from endoscopic to open surgery.
Conclusions: We recommend starting single-port endoscopic CTR using WALANT with a noninflated tourniquet in place for use when necessary.
Type of study/level of evidence: Therapeutic IV.

Currently, an increasing number of hand surgery procedures can be performed under local anesthesia with the adjunct of a vasoconstrictive agent, avoiding the need for a tourniquet.[1–3] This has become known as the wide-awake local anesthesia no tourniquet technique (WALANT).

Kerrigan et al described WALANT for single-port endoscopic carpal tunnel release (CTR) in detail and reported good results in a series of 80 patients with no disadvantages for either the patient or the surgeon.[4] However, to the authors' knowledge, there is no systematic analysis specifically deals with endoscopic CTR with WALANT, although numerous studies assessed WALANT for open CTR with good results.[5,6]

We report a prospective case series assessing the patient and surgeon experience, as well as complications with WALANT for single-port endoscopic CTR.

Materials and Methods

Between July and November 2018, we prospectively included all patients with confirmed carpal tunnel syndrome by electrodiagnostic testing who were aged greater than 18 years and were undergoing endoscopic CTR. We obtained written informed consent during the routine consultation for procedure planning. Exclusion criteria were unwillingness to participate (n = 0), pregnancy (n = 1), contraindications for the application of local anesthesia (n = 2), contraindications for surgery (n = 0), and potential lack of follow-up (eg, noncompliance, language barrier, unexcused absence) (n = 0).

Patients were enrolled during routine consultation for operation planning. The 2 consulting and operating senior surgeons collected data in a standardized form, which included basic demographic data, general medical information, disease-specific information, and the patient's rating of the procedure before, during, and after the operation at 3, 6, and 12 weeks. Patients reported pain using the visual analog scale (VAS) from 0 to 10 for the application of the anesthetic and the operation itself; they rated the whole procedure as very good, fairly good, somewhat painful, or very unpleasant. During the final visit, patients compared current symptoms with the preoperative status, deciding whether symptoms were resolved

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

Corresponding author: Thuan Vinh Ly, MD, Clinic for Hand, Plastic, and Peripheral Nerve Surgery, Kantonsspital Aarau, Tellstrasse 25, CH-5001 Aarau, Switzerland.
E-mail address: Thuan.Ly@ksa.ch (T.V. Ly).

https://doi.org/10.1016/j.jhsg.2019.10.005

substantially or completely or had no change. Patients who underwent sequential operations for both wrists were recorded as 2 separate cases.

The surgeon's perceptions about this type of surgery compared with endoscopic CTR under local anesthesia with a tourniquet were recorded, relating specifically to intraoperative visualization and bleeding. Complications were defined as nerve injury, infection, or the need for revision surgery.

All procedures were performed by the same 2 senior surgeons with more than 5 years of clinical practice (level 3 specialists) in the WALANT approach, as well as in more than 100 single-port endoscopic CTRs under local anesthesia with exsanguination and tourniquet.[7]

Operative technique

Application of the local anesthetic and the operation were performed according to a standardized protocol 30 minutes before initial incision. As described by Lalonde,[1] a field block was applied to the skin overlying the carpal tunnel. We used 1% lidocaine with the adjunct of epinephrine diluted at a factor of 1:100'000. The operation was performed using the single-port technique similar to that of Agee et al,[8] starting with a volar transverse incision roughly 8 to 10 mm long, ulnar to the palmaris longus tendon and proximal to the distal palmar wrist crease. The forearm fascia was released toward the proximal forearm under direct visual control for 1 cm and a dull dilator was passed distally under the flexor retinaculum to free it from any potential adherent structures. The endoscope was passed into and through the carpal tunnel. Then, the fibers of the flexor retinaculum were completely divided under visual control in a distal to proximal direction using a SmartRelease endoscopic soft tissue release system (MicroAire Surgical Instruments, Charlottesville, VA). The incision was irrigated with saline and closed with an intradermal running nonabsorbable suture, which was removed 2 weeks after surgery.

The authors performed clinical evaluation and descriptive data analysis.

Approval from the local Swiss ethics committee on research (Project ID 2017-00304) involving humans was obtained before the study began.

Results

The cohort consisted of 20 patients (24 wrists), mean age 57 years (range, 39–92 years). Sixteen patients were women (Table 1). Eleven patients had comorbidities, among which were hypertension (6) and diabetes type 2 (2). One patient had rheumatoid arthritis, which was stable with immunosuppressive medication (low-dose steroid intake), and one was receiving oral anticoagulants because of atrial fibrillation, which were not paused for the operation. Two patients were smokers.

Average operation time was 14 minutes (range, 7–25 minutes). The total amount of anesthetic agent used per procedure was 15 to 20 mL. One procedure had to be converted to the open technique because of technical difficulties caused by a narrow carpal tunnel. This patient also reported a relatively high VAS score of 5 during surgery and rated the procedure as very unpleasant. However, after 5 months, the neurologic symptoms of the carpal tunnel syndrome had resolved completely. In another case, a tourniquet had to be applied and inflated during surgery because of the inadequate effect of the vasoconstrictive epinephrine. Although this patient gave an overall rating of very good, he stated that this aspect bothered him during the procedure (VAS = 4; operation time, 20 minutes).

In 16 cases, the reported VAS was 3 or lower during application of the anesthetic agent (mean, 2.9), and in 22 it was 2 or less during surgery (mean, 1.2). Overall, the global rating for the procedure was very good in 22 cases. During the postoperative follow-up at 3 months, which all patients completed, no complications were recorded and all but one participant reported completely or substantially resolved symptoms. Table 2 details all patient outcomes.

Table 1
Baseline Characteristics of Cohort

Case	Age, y	Sex	Duration of Symptoms, mo	Motor Nerve Conduction Velocity, ms*	Sensory Nerve Conduction Velocity, m/s†
1	39	F	4	6.4	30
2	92	F	18	5.8	35
3	85	F	6	8.9	No response
4	58	F	24	8.3	23
5	58	F	24	5.6	48
6	45	F	24	5.5	58
7	46	M	24	3.1	52
8	46	M	26	3.1	51
9	71	M	4	5.5	25
10	71	M	6	6.6	36
11	71	F	6	5	30
12	53	M	36	4.9	40
13	59	M	8	6.1	32
14	83	F	36	7	21
15	83	F	36	8.4	18
16	57	F	5	5.4	33
17	28	F	5	5	27
18	56	F	48	5.7	35
19	72	F	48	6.3	27
20	66	F	45	5.8	No response
21	56	M	30	5.4	36
22	58	F	6	6	No response
23	22	F	8	4.7	39
24	68	M	36	6.2	28

* Normal is less than 4.0 ms.
† Normal is greater than 40 m/s.

The operating surgeons reported 8 procedures with impaired vision of the transverse ligament caused by bleeding and edema in the operative field. This did not lead to a conversion or postoperative complications, as shown in Table 2. When asked about their experience with the WALANT technique for this kind of operation, both surgeons clearly rated it technically more demanding compared with endoscopic release with a tourniquet (whether under local, regional, or general anesthesia), mainly because of impaired visualization.

Discussion

Overall, and unsurprisingly, the patients in this series generally reported favorable outcomes. These data confirm that WALANT provides adequate analgesia and its application seems to be well-tolerated by patients.[9] In accordance with other published studies, pain control was adequate and most patients would choose to undergo the procedure again.[5] A study conducted in Germany in 2008 recorded patients' experience after minor procedures (such as open CTR and trigger finger release).[10] Those 119 patients gave mean VAS for the anesthetic application of 2.8 and 0.8 for the operation itself, which are comparable to our ratings of an average of 2.9 and 1.2, respectively.

Although both surgeons were experienced with endoscopic CTR and WALANT, the combination of them was perceived to be considerably more demanding than expected. The most likely explanation for this difficulty was impaired visualization caused by bleeding and subsequent edema as a result of fluid injected to obtain successful WALANT and the lack of exsanguination from the tourniquet. Expressing part of the fluid with gauze rolled over the palm from volar distal to proximal helps to overcome this problem and continue the operation safely. This finding is surprising because

Table 2
Patients and Surgeons Reports

Case	Application, mL	Duration of Operation, min	VAS During Application of Local Anesthetic	VAS During Operation	Rating of Procedure by Patient*	Symptoms at 12 wk	Intraoperative Report by Surgeon
1	15	20	7	0	A	b/r	
2	18	7	2	1	A	b/r	
3	18	25	1	1	A	b/r	Incomplete visualization
4	18	10	2	0	A	b/r	
5	18	11	1	1	A	b/r	Incomplete visualization
6	17	15	3	2	A	b/r	Incomplete visualization
7	17	15	4	0	A	b/r	
8	17	10	3	0	A	b/r	
9	20	7	1	1	A	b/r	
10	20	8	2	0	A	b/r	
11	17	10	2	2	C	b/r	Incomplete visualization
12	20	17	1	1	A	b/r	Incomplete visualization
13	20	12	4	4	A	b/r	Incomplete visualization
14	20	20	1	0	A	b/r	
15	20	7	0	1	A	b/r	
16	20	9	2	2	A	b/r	
17	20	8	7	0	A	b/r	
18	20	18	5	2	A	b/r	
19	20	9	5	0	A	b/r	Incomplete visualization
20	20	20	5	5	D	No change, b/r after 5 mo	Conversion
21	18	18	2	0	A	b/r	
22	18	16	7	0	A	b/r	
23	15	13	3	0	A	b/r	
24	15	17	1	0	A	b/r	

b/r, better or resolved completely.
* Rating of procedure: A = very good; C = somewhat painful; D = very unpleasant.

we tried to respect the same dosage (mean, 18.3 mL; range, 15–20 mL) and relative concentration of the local anesthetic and epinephrine as described by Lalonde.[11] We also followed the suggested interval of 30 minutes between application of the local anesthesia and surgery. In one case, a proximal upper arm tourniquet had to be applied during surgery because of the inadequate effect of the vasoconstrictive epinephrine. Alternative methods of employing the tourniquet distal to the elbow would also be an option, but they might cause technical difficulties with the use of the endoscope.

We did not note higher complication rates for this procedure. This is in line with a systematic meta-analysis comparing open and endoscopic CTR that found a low complication rate for both techniques.[12] Endoscopic CTR is technically more demanding than the open technique and thus mandates a longer learning curve.[13,14] An anatomically narrow carpal tunnel can be especially challenging. This was the case in one patient in the current study, in whom conversion to the open technique was necessary. This particular patient, who was given the diagnosis of a severe carpal tunnel syndrome (EMG) before surgery, described the procedure as very unpleasant and reported no change in symptoms at 3 months after surgery. No revision surgery was needed, and after 5 months, the patient was asymptomatic. In the current study, we could not determine factors rendering this operation more difficult using WALANT.

This study provides evidence that WALANT for endoscopic CTR produces standard surgical results with low complication rates; in contrast to tourniquet-assisted techniques, it is subjectively comfortable for patients. However, surgeons found the operation to be more challenging than anticipated. Although this is a small series, we believe other surgeons might face the same problems, especially early in the learning process. We had impaired visualization with WALANT in a third of cases. We therefore recommend applying a noninflated tourniquet for use when necessary. The current series is only a preliminary report; technical difficulties that were encountered may be resolved over time as further experience is accumulated. In our institution, we perform endoscopic CTR with WALANT in selected cases, especially for patients reporting pain or discomfort caused by a previous experience with tourniquets.

References

1. Lalonde DH. *Wide Awake Hand Surgery*. New York, NY: Thieme; 2016.
2. Lalonde DH. Latest advances in wide awake hand surgery. *Hand Clin*. 2019;35(1):1–6.
3. Rhee PC. The current and possible future role of wide-awake local anesthesia no tourniquet hand surgery in military health care delivery. *Hand Clin*. 2019;35(1):13–19.
4. Kerrigan CL, Lalonde D, Shu GX, Jin BT. Carpal tunnel decompression of the median nerve. In: Lalonde D, (Ed). *Wide Awake Hand Surgery*. New York, NY: Thieme; 2016:129–136.
5. 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 tourniquet: a randomized controlled trial. *J Hand Surg Eur Vol*. 2018;43(8):808–812.
6. Sasor SE, Cook JA, Duquette SP, et al. Tourniquet use in wide-awake carpal tunnel release [published online ahead of print July 1, 2018]. *Hand (N Y)*. https://doi.org/10.1177/1558944718787853.
7. Tang JB, Giddins G. Why and how to report surgeons levels of expertise. *J Hand Surg Eur Vol*. 2016;41(4):365–366.
8. Agee JM, McCarrol HR Jr, Tortosa RD, Berry DA, Szabo RM, Peimer CA. Endoscopic release of the carpal tunnel: a randomized prospective multicenter study. *J Hand Surg Am*. 1992;17(6):987–995.
9. Thomson CJ, Lalonde DH, Denkler KA, Feicht AJ. A critical look at the evidence for and against elective epinephrine use in the finger. *Plast Reconstr Surg*. 2007;119(1):260–266.
10. Koegst WHH, Wölfle Thoele K, Sauerbier M. The “wide awake approach” in hand surgery—a comfortable anaesthesia method without a tourniquet [in German]. *Handchir Mikrochir Plast Chir*. 2011;43(3):175–180.
11. Lalonde D, Phillips A, McGrouther D. Tumeschent local anesthesia. In: Lalonde D, (Ed). *Wide Awake Hand Surgery*. New York, NY: Thieme; 2016: 29–35.
12. Vasiliadis HS, Nikolakopoulou A, Shrier I, et al. Endoscopic and open release similarly safe for the treatment of carpal tunnel syndrome: a systematic review and meta-analysis. *PLoS One*. 2015;10(12):e0143683.
13. Beck JD, Deegan JH, Rhoades D, Klena JC. Results of endoscopic carpal tunnel release relative to surgeon experience with the Agee technique. *J Hand Surg Am*. 2011;36(1):61–64.
14. Makowiec RL, Nagle DJ, Chow JC. Outcome of first-time endoscopic carpal tunnel release in a teaching environment. *Arthroscopy*. 2002;18(1):27–31.