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Research article

Use of WALLANT technique in hand surgery, safe and advantageous. Personal experience

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Abstract

Objectives. To confirm the efficiency of using local anesthesia with lidocaine and epinephrine in hand surgery.

Materials and methods. 75 patients in whom we used local anesthesia with 1% lidocaine and epinephrine in solution 1: 100 000. We evaluated the amount of used anesthetic, the time to onset of anesthesia, intraoperative bleeding, the duration of intervention and hospitalization, immediate postoperative complications.

Results. It has been no case of digital necrosis or other vascular complications and no intraoperative bleeding. The amount of the used anesthetic varied. In no case it was necessary to use of phentolamine as an antidote to the effects of adrenaline.

Conclusions. Wide awake local anesthesia no tourniquet technique is safe, having many advantages: it is not necessary to use the tourniquet with or without intravenous sedation, the surgeon and patient comfort is maximum, there is no risk of digital necrosis, hospitalization time is short and the costs are minimal.

Keywords : hand surgery, wide awake, local anesthesia

Highlights

- ✓ The use of WALANT technique in hand surgery is safe and efficient and has multiple advantages for both the patient and the surgeon.
- ✓ All these advantages are complemented by the short hospitalization which leads to substantial cost reduction of surgical intervention.

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Introduction

General and regional anesthesia with their well-known risks were and are still used by most surgeons to perform hand and wrist surgeries. In recent years there is a growing interest in performing these surgeries using local anesthesia. For many years local injection of epinephrine was blamed for causing finger necrosis. However further experience demonstrated that the culprit for this finger necrosis was procaine, the only local anesthesic known at that time. Evidence based medicine cleared this misconception and proved that local anesthesia using lidocaine and epinephrine is safe. This awake surgery without sedation and without tourniquet offers many advantages: no risks and side effects of general or regional anesthesia, less time for anesthesia, greater comfort for patient, allows movement of operated hand/wrist, allows interaction with patient, faster recovery, shorter hospital stay and lower costs.

WALANT stands for „wide awake local anesthesia no tourniquet" and is the term used to define that the surgery is performed with the awake patient, under local anesthesia and without a tourniquet. Today, many procedures like carpal tunnel syndrome, trigger finger, Dupuytren contracture, tendon repair and transfer, wrist and metacarpal fractures, finger arthrodesis are performed wising WALANT technique. The aim of this study is to confirm the utility, safety and benefits of using WALANT technique and to encourage its use in Romania for as many different hand and wrist surgeries as possible.

Materials and methods

The study was conducted in a group of 75 patients admitted to our institution starting with January 2017. Included in the study were 40 men and 35 women (M/F ratio = 1.14) aged 24 to 76 years, mean age 54.21 years (Figure 1).

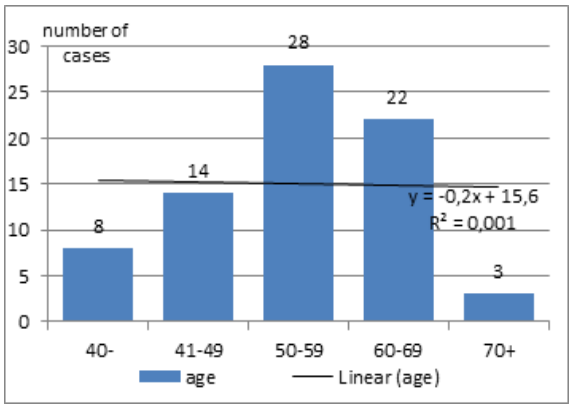

Figure 1. Age histogram - total group

Of the total of 75 patients, 32 were diagnosed with carpal tunnel syndrome (CTS, 17 men and 15 women), 28 patients with various stages of Dupuytren's disease (DD) with involvement of one or two digital rays, and 15 with trigger finger (TRF). In patients with DD and CT there was no significant difference in hand involved (R: L = 1.06) (Table 1).

Variables		*Number*	*%*
Gender (TOTAL)	M	40	53.33
	F	35	46.67
Age group (TOTAL)	mean	54.21	n/a
	max	76	n/a
	min	24	n/a
	≤ 40	8	10.66
	41-49	14	18.66
	50-59	28	37.33
	60-69	22	29.33
	≥70	3	4.02
Hand (DUP+CTS)	right	31	48.33
	left	29	51.67
Number of fingers (DUP)	1	15	53.37
	2	12	42.85
	>2	1	3.78

Table 1. Demographic and anatomic variables

Patients in the study group were diagnosed with such associated diseases as hypertension and insulin-dependent diabetes mellitus. They accounted for 25% of the group of patients with CTS and 35.71% of the group of patients diagnosed with DD. The anesthetic used in all cases was a solution of lidocaine 1% with 1:100,000 epinephrine without buffering it with 8.4% sodium bicarbonate at 10:1 ratio. Also, for reducing pain, the skin at the injection site was cooled with ice for 30 sec - 1 min in 30% of the cases. The maximal safe dosage of 7mg/kg was respected. For injection of the anesthetic we used a thin syringe needle (27 G). The needle was inserted perpendicular to the skin in a fold made by lifting the skin with the thumb and index fingers by exerting a pressure to reduce pain caused by needle penetration into the skin. Initially we injected 0.3-0.5 mL immediately below the dermis. After the patient no

longer felt pain, the remaining anesthetic was injected by a deeper needle penetration (about 1 cm). The amount of anesthetic solution used did not exceed 20 mL for CTS and 15 mL for each digital ray affected by DD. Regarding the method of anesthetic injection, not the entire amount was injected from the beginning: in the cases with CTS, 10 mL were injected on each side in the immediate vicinity of the incision site. Then, the remaining 10 mL were injected into the skin at the periphery of the area where hypoesthesia was already present. The same method was used in patients with DD, the anesthetic being injected in the vicinity of future incisions. Onset of anesthesia took 6 to 15 minutes, being checked by subjective testing of the patient and by monitoring for skin color change at the injection site. In all cases, intraoperative bleeding was minimal, so the use of tourniquet was not necessary. The vital signs (blood pressure, pulse) and patient reactions confirmed an optimal intraoperative patient comfort, the intervention of the anesthetist for sedation not being required.

Results

In the group of 32 patients with CTS no intraoperative bleeding requiring a tourniquet to be applied on the arm was recorded. There was no need for sedation. The amount of 1% lidocaine with 1:100,000 epinephrine anesthetic solution ranged from 10 mL and 20 mL in 87.5% of cases. In the remaining 12.5% cases, less than 10 mL were sufficient. It should be mentioned that all these patients were diagnosed with hypertension and insulin-dependent diabetes mellitus. No changes in digital vasculature were found in any of these cases. Hospital stay was of at least 6 hours (due to the lack of infrastructure and a legal system for short-term hospitalization). Only one patient stayed in hospital for 48 hours, the patient being diagnosed with neglected essential hypertension with high levels and oscillations (Figure 2).

Figure 2. Use of 1% lidocaine and epinephrine solution – opening of the volar carpal ligament without bleeding

In the group of 28 patients with DD, the maximum amount of anesthetic solution used was 20 mL with values ranging from 7.5 mL to 15 mL per digital ray. Also, the use of tourniquet due to major bleeding and sedation due to severe pain sensation were not reported in any case. There was no digital necrosis due to the use of epinephrine in the anesthetic solution (Figure 3).

Figure 3. Use of local anesthesia with 1% lidocaine and 1: 100,000 epinephrine solution for Dupuytren's disease - optimal intraoperative comfort

Similarly, in the group of 15 patients diagnosed with trigger finger no cases of significant intraoperative bleeding were recorded, the use sedatives was not necessary, and most importantly, there was no digital necrosis due to the use of anesthetic solution of 1% lidocaine and 1:100,000 epinephrine. As to the amount of anesthetic solution used in these cases, it did not exceed 4 mL in 60% of patients, was of 5 mL in 26.66% and 6 mL in 13.33% of cases. Data were statistically processed using the SPSS 20.0 software, taking into account Pearson correlation coefficients with statistical significance, using regressions (ANOVA), for alpha at most .05 and CI 95%. The correlation coefficient between the amount of anesthetic and number of digital rays affected by DD was 0.63, for $p = 0.0002$ (Significance $F < 0.001$), showing that there is a positive, direct and high correlation, and the statistically significant results could be extrapolated to larger study groups. Regression (ANOVA) showed that the length of hospital stay was correlated positively, moderately and directly with the amount of anesthetic used in the CTS group, with a correlation coefficient of 0.52, statistically significant with the value of $p < 0.01$ (Significance $F = 0.002$). Applying regression in analysis of variance (ANOVA), correlating the amount of anesthetic used in the whole study group with the onset of anesthesia resulted in a correlation coefficient value of 0.43, indicating a moderate but highly statistically significant correlation for $p << 0.00001$ (Table 2).

Variables		*Number*	*%*
Anesthetic solution (mL)	<10 mL	20	26.67
	10-14 mL	18	24.00
	15-19 mL	14	18.67
	≥20 mL	23	30.66
	Mean DUP (max/min)	14.82 (20/6)	n/a
	Mean CTS (max/min)	16.31 (20/8)	n/a
	Mean TRF (max/min)	4.46 (6/3)	n/a
	Mean total lot (max/min)	13.38 (20/3)	n/a
Timp instalare anestezie	<10 min	30	40.00
	10-14 min	33	44.00
	15-20 min	12	16.00
	Mean DUP (max/min)	12.42 (20/7)	n/a
	Mean CTS (max/min)	10.56 (20/7)	n/a
	Mean TRF (max/min)	6.46 (8/5)	n/a
	Mean total lot (max/min)	10.44 (20/5)	n/a
Intraoperative bleeding	yes	9	
	no	65	
Surgeon comfort	+++	63	84.00
	++	12	16.00
Patient comfort	+++	62	82.67
	++	13	17.33
Length of hospital stay (hours)	≤8	50	66.67
	12	8	10.67
	24	13	17.33
	>36	4	5.33
	Mean DUP (max/min)	15.92 (48/6)	n/a
	Mean CTS (max/min)	12.46 (48/5)	n/a
	Mean TRF (max/min)	1.86 (8/1)	n/a
	Mean total group (max/min)	11.64 (48/1)	n/a

Table 2. Surgical variables

Discussion

The study of the effects of adrenaline injection in the fingers was resumed in an attempt to improve the effects of anesthetics: higher efficacy after the administration of an as low as possible amount, quicker onset time, longer duration of action, and lowest possible toxicity. The "epinephrine myth" postulated that "never inject epinephrine in fingers, nose, penis or toes", epinephrine being incriminated as a cause of digital necrosis, being used with procaine in local anesthesia in hand surgery (1, 2). Time has shown that the reason for these serious complications was procaine acidity, which changes its pH when kept for a long time. In 1957, to reverse the vasoconstrictor effects of epinephrine, phentolamine was discovered (3). However, the use of epinephrine in local hand anesthesia remained in a shadowy cone in the coming years. However, the "epinephrine myth" did not stop P. Shoemaker from using the lidocaine: epinephrine solution for anesthesia in case of tendon rupture, and R. McFarlane who used the same anesthetic solution in DD surgery (1). Thomson showed that the use of local anesthesia with adrenaline in fingers is effective and, most importantly, is safe and does not cause digital necrosis (4). Lalonde started to use epinephrine in local anesthesia in hand surgery recording no digital necrosis. In his multicenter study of 3,110 consecutive patients attended by 9 surgeons from 6 hospital centers, Lalonde (2005) demonstrated that the use of 1% lidocaine and 1:100,000 epinephrine is a safe technique with many advantages (5). The technique was called WALANT - wide awake local anesthesia no tourniquet - because it avoids the use of the tourniquet. In 2007, Fitzcharles-Bowe reported that there was no finger necrosis after accidental digital injection of high-dose (1:1,000) epinephrine (6). Studies on the effects of epinephrine use in local anesthesia in hand surgery have been also conducted by Chowdhry (2010), Muck (2010) and Mann (2012) (7-9). Lalonde established in 2013 the dosage of 1% lidocaine with 1:100,000 epinephrine for the typical surgical procedures, recommending the use of 20 cc for CTS, 4 cc for trigger finger, 15 cc for each digital ray affected by DD, 40 cc for Bennet fracture and metacarpal fractures (10). Taking into account these recommendations, in our study we used volumes of anesthetic solution of 8.5 mL to 15 mL per digital ray affected by DD, 8 mL to 20 mL for CTS, and 3 mL to 6 mL for trigger finger. Lalonde and other authors have studied the technique of injecting the anesthetic solution to produce minimal pain proposing that lidocaine and epinephrine 10:1 to be buffered with 8.4% bicarbonate;

the anesthetic solution to be warmed at body temperature, the use of thin needles, insertion of the needle perpendicular to the skin with the injection of the first 0.5 mL subdermally until the patient no longer feels pain, then the anesthetic to be gradually injected, and the area of injection to be distracted with touch, pinch, or pressure (11, 12). The anesthetic solution used in our study was not buffered with 8.4% bicarbonate, but we followed the recommendations regarding how to inject the anesthetic to cause less pain to the patient. Although there are no reports of ischemia or necrosis due to the use of the WALANT technique, the authors recommend, if necessary, the administration of phentolamine in the hand surgery services using the WALANT technique (3). This local anesthesia technique that uses 1% lidocaine with 1:100,000 epinephrine has the advantage of avoiding the risks associated with locoregional anesthesia, avoiding the use of sedation and, in fact, of its toxicity, of which the anesthesiologists say "the best sedation is no sedation". The cost of preoperative preparation decreases substantially as no preanesthetic assessment is required when using locoregional anesthesia (axillary, infraclavicular blocks) (13). The fact that this type of anesthesia avoids the use of tourniquet has several advantages: absence of pain or discomfort associated with tourniquets, a more comfortable position on the operating table and adaptable in case of patients with articular rheumatic diseases who do not tolerate certain positions on the operating table, avoidance of bleeding after tourniquet deflation (14, 15). Among the advantages of this technique are also the short onset time of anesthesia, the possibility of intraoperative cooperation with the patient, accurate assessment of hand and finger movements (in the case of tenorrhaphies or tenoplasties) (16, 17). It is also worth mentioning that this type of anesthesia can also be used in patients with associated conditions and that it does not require the discontinuation of anticoagulant treatment. All these advantages are complemented by the short hospital stay which leads to substantial cost reduction of surgical intervention. All these advantages have made the use of WALANT technique to extend to foot and ankle surgery (18).

Conclusions

The use of WALANT technique in hand surgery is safe and efficient, has many advantages for both the patient and the surgeon, and is cost-saving. Complications such as digital necrosis are excluded when 1% lidocaine with 1:100,000 epinephrine anesthetic solution not exceeding the safe zone of 7mg/kg is used.

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