



Use of the WALANT technique for the surgical treatment of carpal tunnel syndrome: literature review

Uso da técnica WALANT para tratamento cirúrgico da síndrome do túnel do carpo: revisão da literatura

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■ ABSTRACT

Carpal tunnel syndrome is one of the most common pathologies in the upper limb; it is the most common compressive neuropathy, causing significant morbidity. Many of those affected need surgical treatment; thus, the WALANT technique would be an excellent option to allow faster treatment of patients waiting for it. This study aims to carry out an integrative review on applying the WALANT technique for the surgical treatment of carpal tunnel syndrome, emphasizing the efficacy and safety of the procedure. An integrative literature review was performed using the “Wide Awake Local Anesthesia No Tourniquet” descriptor. Sixteen studies were selected from the PubMed and VHL databases, applying the eligibility criteria. The selected studies do not report complications associated with applying the WALANT technique. The WALANT technique has evident efficacy and safety for the surgical treatment of carpal tunnel syndrome, with no reports of complications.

Keywords: Carpal tunnel syndrome; Median neuropathy; Epinephrine; Lidocaine; Anesthesia.

■ RESUMO

A síndrome do túnel do carpo é uma das patologias mais incidentes no membro superior; é a neuropatia compressiva mais comum, acarretando importante morbidade. Grande parcela dos acometidos necessitam de tratamento cirúrgico; desse modo, a técnica WALANT seria uma excelente opção para permitir maior celeridade do tratamento desses pacientes que o aguardam. Este estudo visa realizar uma revisão integrativa sobre a aplicação da técnica WALANT para tratamento cirúrgico da síndrome do túnel do carpo, ressaltando a eficácia e a segurança do procedimento. Foi realizada uma revisão integrativa na literatura, utilizando o descritor “Wide Awake Local Anesthesia No Tourniquet”. Aplicando os critérios de elegibilidade, foram selecionados 16 estudos nas bases de dados PubMed e BVS. Os estudos selecionados não relatam complicações associadas à aplicação da técnica WALANT. A técnica WALANT apresenta evidente eficácia e segurança para o tratamento cirúrgico da síndrome do túnel do carpo, sem relatos de complicações.

Descritores: Síndrome do túnel carpal; Neuropatia mediana; Epinefrina; Lidocaína; Anestesia.

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INTRODUCTION

Carpal tunnel syndrome (CTS) is the most common compressive neuropathy in the upper limb and one of the main pathologies that affect the upper limbs; the estimated prevalence is around 4%, especially in

patients between 40 and 60 years of age, with an average proportion of 3:1 prevailing in the female population; and the most frequent cause is idiopathic^{1,2}.

Anatomically, the carpal tunnel consists of an inextensible osteofibrous tunnel, limited by the flexor retinaculum superiorly; medially, by the hamate,

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pyramidal and pisiform hamulus; laterally, by the scaphoid, trapezius and flexor carpi radialis tendon and, inferiorly, delimited by the carpal bones - which are covered by the volar capsuloligamentous structures of the carpus.

The tunnel's contents are represented by the fingers' superficial and deep flexor tendons, the flexor pollicis longus, and the median nerve. The median nerve travels through the tunnel anteriorly to the superficial flexor tendons so that it is susceptible to compression in the event of any increase in pressure inside the tunnel^{3,4}.

Clinically, carpal tunnel syndrome has classical repercussions with pain symptoms and, above all, paresthesia in the territory innervated by the median, which corresponds to the volar surface of the 2nd, 3rd and radial half of the 4th finger. The diagnosis is essentially clinical, through anamnesis and specific workup, including the Phalen and Tinel tests and the Durkan test, the most sensitive and specific for the diagnosis of CTS^{5,6}. However, complementary exams can be very useful for evaluating differential diagnoses, especially the electroneuromyographic exam, which helps define the location of compression and quantify the severity of the lesion by measuring conduction velocities of the study myographic.

A relevant portion of the cases affected by this disease requires surgical treatment, which consists of the surgical release of the carpal tunnel by opening the flexor retinaculum to allow the reduction of pressure on the median nerve.

However, the availability of structure to perform the procedure remains far from meeting the Unified Health System (SUS - *Sistema Único de Saúde*, in Portuguese) demand, culminating in a long waiting time for the procedure to be performed. This fact stems from several limiting factors, among the most relevant are: lack of availability of operating room schedules, lack of availability of anesthesiologists and unavailability of surgical beds due to the overcrowding of orthopedics units due to the high number of traumas in our country.

As an alternative to resolving this issue, the provision of performing this procedure on an outpatient basis, with local anesthesia, emerged. This type of procedure, called WALANT (an acronym for the expression: Wide Awake Local Anesthesia No Tourniquet), has been gaining increasing popularity among hand surgery specialists around the world since the publication by Lalonde et al. in 2005, which, in this study, demonstrated the efficacy and safety of using a vasoconstrictor at an adequate dilution of 1:100,000 in extremities⁷.

The WALANT technique relies on using a mixture of local anesthetic (lidocaine) with epinephrine to allow the operative field to be properly visualized through the vasoconstrictor effect of epinephrine, providing a safe and efficient condition for performing procedures on extremities⁸.

OBJECTIVES

Because of this, the present study aims to review the literature, seeking evidence that supports the efficacy and safety of the WALANT technique, used specifically in the surgical treatment of carpal tunnel syndrome.

METHODS

The study is an integrative literature review aiming to gather and synthesize the research results on the use of the WALANT technique in treating CTS in a systematic and orderly manner. Thus, the integrative review is an extremely relevant instrument for demonstrating research results, providing a synthesis of knowledge and incorporating the applicability of results of significant studies in practice. In this way, it is also possible to incorporate, in the research, the definition of concepts, the revision of theories and the methodological analyzes of the included studies⁹.

In the present study, the guiding question of the research was this: is the WALANT technique safe and effective for application in the surgical treatment of carpal tunnel syndrome?

For the elaboration of this study, a data search was carried out in the PubMed and VHL databases, using the descriptor: "WIDE AWAKE LOCAL ANESTHESIA NO TOURNIQUET." In the PubMed database, 91 articles were reported and, in the VHL, 82 articles were reported. After analyzing the titles, all articles that did not refer to the treatment of carpal tunnel syndrome or the use of local anesthetic in hand procedures were excluded.

There remained 17 articles from the PubMed database and 14 from the VHL.

After reading these articles, those that did not include open surgical treatment of carpal tunnel syndrome in the series and studies with more than ten years of publication were excluded.

The final search result found 16 articles (Figure 1).

RESULTS

After reviewing the literature, the selected studies were analyzed. Most studies were designed as descriptive studies on applying the WALANT technique compared to conventional techniques (local anesthesia without epinephrine, intravenous regional block and

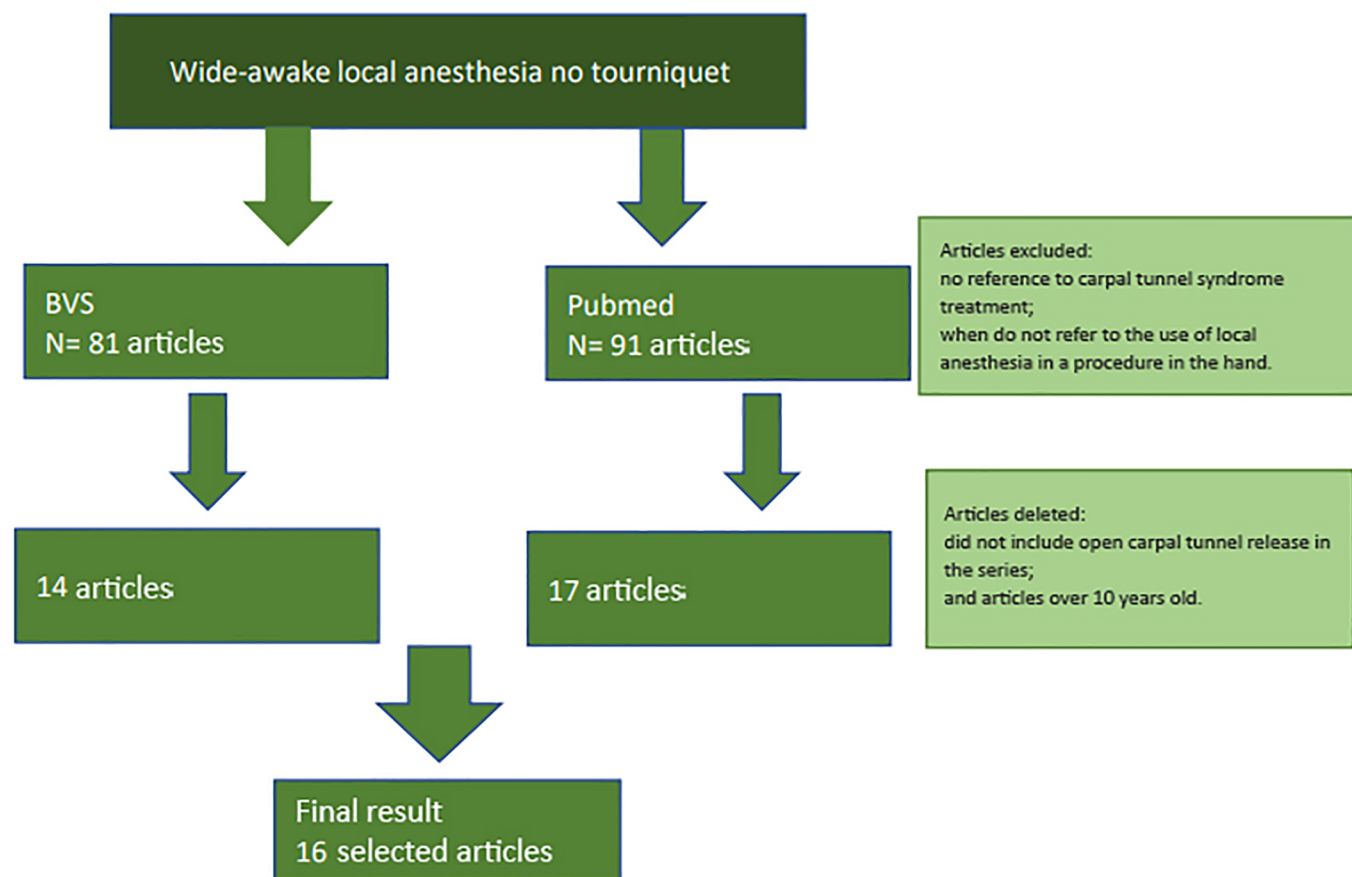


Figure 1. Flowchart of the selection of publications for the review.

general anesthesia). In addition, two systematic reviews were obtained (Table 1).

Sasor et al.¹², Gunasagaran et al.¹⁸, Olaiya et al.¹¹ and Iqbal et al.²¹ compared the results obtained using WALANT with those obtained using local anesthesia, without epinephrine, but with the use of a tourniquet on the upper limb. They concluded that, although the WALANT technique requires more surgical time, the discomfort caused by the tourniquet was the main complaint of the patients.

Sraj¹³ carried out her study on the confrontation of the carpal tunnel release technique using local anesthesia, with and without epinephrine. Cases without the use of epinephrine had longer surgical times.

Ayhan & Akaslan¹⁰ carried out research that evaluated the results of intravenous regional anesthesia with the WALANT technique. In their study, the patient had bilateral CTS and, on each side, a technique was applied; as a result, the vast majority of patients were more satisfied with the WALANT technique.

Kang et al.¹⁷ compared pain parameters and functional results in patients undergoing the WALANT technique with patients undergoing local anesthesia, without epinephrine, and general anesthesia. They

concluded that patients in the WALANT group had lower postoperative pain scores, while the functional results did not show had lower postoperative pain scores, while the functional results did not show statistically significant differences. Tulipan et al.²⁴ also compared the WALANT technique with general anesthesia, using functional scores and a visual analog scale for pain. They did not find any statistical difference between one method over the other, concluding that both methods are safe and efficient, leaving it up to the surgeon to choose with complete safety. Still comparing the results of patients undergoing carpal tunnel release under general anesthesia and WALANT, Teo et al.²³ concluded that the latter group had lower postoperative pain scores, evidenced by the lower use of opioids in the immediate postoperative period.

Far-Riera et al.¹⁴, in their study, compared the results regarding pain scores, patient satisfaction and costs in patients undergoing regional anesthesia with patients undergoing the WALANT technique. They concluded that patients undergoing the second required less postoperative analgesia, highlighting an important fact: the reduction in costs using this WALANT technique. Alter et al.²⁰ also analyzed the costs in their research, from which they compared the costs of the WALANT technique

Table 1. List of selected studies, broken down by title, author, year, country and design.

Title	Author	Year	Country	Design of Study
Patients' perspective for carpal tunnel release with walant or Intravenous regional anesthesia	Ayhan & Akaslan ¹⁰	2020	Turkey	Prospective cohort
Carpal tunnel release without a tourniquet: a systematic review and meta-analysis	Olaiya et al. ¹¹	2020	Canada	Systematic review and meta-analysis
Tourniquet use in wide- awake carpal tunnel release	Sasor et al. ¹²	2020	USA	Retrospective cohort
Carpal tunnel release with wide-awake local anesthesia and no tourniquet: with versus without epinephrine	Sraj ¹³	2019	USA	Retrospective cohort
Prospective study on the application of a WALANT circuit for surgery of tunnel carpal syndrome and trigger finger	Far-Riera et al. ¹⁴	2019	Spain	Prospective cohort
Wide-awake local anesthesia no tourniquet (WALANT) versus local or intravenous regional anesthesia with a tourniquet in atraumatic hand cases in orthopedics: a systematic review and meta-analysis	Evangelista et al. ¹⁵	2019	Philippines	Systematic review and meta-analysis
Wide awake local anesthesia no tourniquet: a pilot study for Carpal Tunnel Release in the Philippine Orthopedic Center	Castro Magtoto & Alagar ¹⁶	2019	Philippines	Case series report
Open cubital and carpal tunnel release using the wide-awake technique: Reduction of postoperative pain	Kang et al. ¹⁷	2019	South Korea	Case series report
Perceived comfort during minor hand surgeries with wide-awake local anesthesia no tourniquet (WALANT) versus local anesthesia (LA)/tourniquet	Gunasagaran et al. ¹⁸	2019		Randomized clinical trial
Wide-Awake Hand Surgery in Two Centers in China Experience in Nantong and Tianjin with 12,000 patients	Tang et al. ¹⁹	2019	China	Case series report
A cost analysis of carpal tunnel release surgery performed wide awake versus under sedation	Alter et al. ²⁰	2018	USA	Retrospective cohort
Pain and outcomes of carpal tunnel release under local anesthetic with or without a tourniquet: a randomized controlled trial	Iqbal et al. ²¹	2018	United Kingdom	Randomized clinical trial
488 hand surgeries with local anesthesia with epinephrine, without a tourniquet, without sedation and without anesthesiologist	Sardenberg et al. ²²	2018	Brazil	Prospective cohort
Patients' perspective of wide-awake hand surgery — 100 consecutive cases	Teo et al. ²³	2017	United Kingdom	Case series report
Open carpal tunnel release outcomes: performed wide-awake versus with sedation	Tulipan et al. ²⁴	2017	USA	Prospective cohort
Evaluation of the surgical treatment of carpal tunnel syndrome with local anesthesia	Barros et al. ²⁵	2016	Brazil	Retrospective cohort

with the release of the carpal tunnel under sedation and concluded that there is an important reduction in expenses with the use of the local anesthesia technique associated with epinephrine.

Castro, Magtoto & Alagar¹⁶ and Barros et al.²⁵ carried out descriptive studies of the results of their series of cases submitted to the WALANT technique, and both are emphatic on the safety and effectiveness of the technique. Like Sardenberg et al.²², they emphasize the important effectiveness in applying the WALANT technique in their series.

Tang et al.¹⁹, in their descriptive study, report the experience of applying the WALANT technique in two reference centers in China. Furthermore, like the other

works, they emphasize the important effectiveness of the technique.

Evangelista et al.¹⁵ performed a systematic review comparing pain parameters, surgical time, patient satisfaction, and complication rate. The following results were obtained: despite the WALANT technique having a longer surgical time, it showed significantly lower pain scores and greater patient satisfaction, while complication rates were zero in both groups.

DISCUSSION

One of the essential conditions for the safe practice of surgical procedures on the hands is the

absence, or the maximum possible reduction, of bleeding since the difficulty in correctly visualizing the structures could increase the chance of iatrogenic injuries. Therefore, the use of a tourniquet on the upper limb has become the most commonly used method to obtain the cessation of bleeding in the surgical field since, until then, the use of vasoconstrictor substances would be proscribed.

The medical literature and medical teaching perpetuate the belief that adrenaline should not be injected into the extremities; otherwise, it could lead to necrosis of the extremities. Little attention has been paid to analyzing the data that created this "belief" and verifying whether it is valid. Thomson et al.²⁶ corroborate all the evidence for the dogma that epinephrine is responsible for necrosis of the extremities, through the report of 21 cases that occurred, particularly before 1950, in which the anesthetic used was procaine or cocaine, plus adrenaline.

In this publication, the authors performed an in-depth analysis of these 21 cases to determine their validity as evidence. They also examined in detail all other data in the literature on safety issues with the injection of procaine, lidocaine and epinephrine into the extremities. Moreover, they concluded that the dogma of digital extremity necrosis associated with the use of adrenaline does not present any consistent data to support this claim; the reported cases would be due to the use of procaine or cocaine, which are known to cause digital infarction. Furthermore, in none of the 21 cases of infarction was there an attempt to reverse the effect of epinephrine with phentolamine^{26,27}.

Another option that points to the safe use of local anesthetic (lidocaine) associated with epinephrine should be highlighted: the possibility of pharmacological reversal of the vasoconstrictor effect of epinephrine through the use of phentolamine. This substance is an alpha-adrenergic receptor antagonist and is used as an effective intravenous antihypertensive drug, mainly used in patients who will undergo pheochromocytoma resection.

The publication of Lalonde in 2005 brought great enthusiasm, above all, in the community of hand surgeons worldwide, since it demonstrated complete safety with the use of local anesthetic associated with epinephrine in more than 3000 procedures, in which no complications have been reported. In addition, it brought up the possibility of performing procedures previously performed only under conventional anesthesia, requiring hospitalization, on an outpatient basis.

After analyzing the results obtained in the literature, it is important to note that all studies used a 1:100,000 dilution of the solution. In some countries, this solution is not commercially ready, having to

prepare it by adding epinephrine to the anesthetic to manufacture the solution with the appropriate dilution. No studies reported complications related to the application of the WALANT technique. All studies emphasize its effectiveness.

Specifically, the application of the WALANT technique for the surgical treatment of carpal tunnel syndrome has been presenting very relevant and motivating data for its application. First, it enables the procedure to be performed on an outpatient basis, without the need for sedative medication and other anesthetic interventions (such as airway management); thus, it avoids the side effects that can result from sedation, such as nausea and vomiting. Due to the smaller structure required to perform the procedure, it is possible to perform a greater number of procedures on the same day⁸.

The technique of tumescent anesthesia with the use of lidocaine associated with epinephrine, with a dilution of 1:100000 (added 1 ml of 8.4% bicarbonate for every 10 ml of anesthetic solution), consists of infiltrating 22 ml of the solution with a needle of the smallest caliber possible (30 x 0.7 mm). Initially, a small amount infiltrates the subdermal tissue (3-4 ml), in the distal portion of the forearm, in the topography between the median and ulnar paths, 8 ml in the subfascial plane of the distal portion of the forearm, and the remaining 10 ml in the subdermal plane and anterior to the transverse carpal ligament. The time required for application is, on average, 5 minutes, and the time determined for the beginning of the incision, so that the greatest vasoconstrictor effect of epinephrine is obtained, is 26 minutes^{8,25,28}.

CONCLUSION

According to current data in the literature, the WALANT technique, used as an anesthetic method for the surgical treatment of carpal tunnel syndrome, is shown to be safe, clearly opposing the postulation that the use of epinephrine in the extremities would be synonymous with necrosis, given that there was no report of ischemia, nor the need for reversal with phentolamine in any case. In addition, the WALANT technique is extremely effective, as it eliminates the need to use any conventional apparatus for a surgical procedure by allowing the procedure to be performed on an outpatient basis, without the need for anesthetic recovery or hospitalization. It is also worth noting that it is also worth noting that the reduction of the necessary structure for the surgical execution and of the incident costs could be an important factor of impact for the celerity of the accomplishment of the procedures, especially in the public health system.

COLLABORATIONS

- DBF** Data analysis and/or interpretation, Final approval of the manuscript, Data Collection, Conception and design of the study, Project Management, Research, Methodology, Writing - Preparation of the original, Writing - Review and Editing, Supervision, Visualization
- VFB** Analysis and/or interpretation of data, Data Collection, Methodology, Writing - Preparation of the original
- SSO** Analysis and/or interpretation of data, Final approval of the manuscript, Conception and design of the study, Writing - Preparation of the original, Supervision

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