



Original Article

Evaluation of surgical treatment of carpal tunnel syndrome using local anesthesia[☆]



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ABSTRACT

Objective: To evaluate the results and complications from surgical treatment of carpal tunnel syndrome by means of an open route, using a local anesthesia technique comprising use of a solution of lidocaine, epinephrine and sodium bicarbonate.

Material and methods: This was a cohort study conducted through evaluating the medical files of 16 patients who underwent open surgery to treat carpal tunnel syndrome, with use of local anesthesia consisting of 20 mL of 1% lidocaine, adrenaline at 1:100,000 and 2 mL of sodium bicarbonate. The DASH scores before the operation and six months after the operation were evaluated. Comparisons were made regarding the intensity of pain at the time of applying the anesthetic and during the surgical procedure, and in relation to other types of procedure.

Results: The DASH score improved from 65.17 to 16.53 six months after the operation ($p < 0.01$). In relation to the anesthesia, 75% of the patients reported that this technique was better than or the same as venous puncture and 81% reported that it was better than a dental procedure. Intraoperative pain occurred in two cases. There were no occurrences of ischemia.

Conclusion: Use of local anesthesia for surgically treating carpal tunnel syndrome is effective for performing the procedure and for the final result.

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Avaliação do tratamento cirúrgico da síndrome do túnel do carpo com anestesia local

RESUMO

Objetivo: Avaliar os resultados e as complicações do tratamento cirúrgico da síndrome do túnel do carpo (STC) por via aberta, com o emprego da técnica anestésica local com uma solução composta por lidocaína, epinefrina e bicarbonato de sódio.

Palavras-chave:

Síndrome do túnel do carpo

Anestesia local

Epinefrina

[☆] Work developed by the Department of Orthopedics and Traumatology, Universidade do Oeste Paulista (UNOESTE), and Orthopedics and Traumatology Service, Hospital Regional de Presidente Prudente, Presidente Prudente, SP, Brazil.

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Materiais e métodos: Estudo de coorte, por meio da avaliação dos prontuários de 16 pacientes submetidos a cirurgia aberta para STC com emprego de anestesia local com 20 mL de lidocaína 1%, adrenalina 1:100.000 e 2 mL de bicarbonato de sódio. Avaliação do escore DASH no pré e pós-operatório de seis meses e comparação da intensidade da dor durante o ato anestésico, durante a cirurgia e em relação a outros tipos de procedimentos.

Resultados: O escore DASH melhorou de 65,17 para 16,53 no pós-operatório de seis meses ($p < 0,01$). Em relação à anestesia, 75% dos pacientes relataram que essa técnica é melhor ou igual a uma punção venosa e 81% relataram que é melhor do que um procedimento dentário. Em dois casos ocorreu dor no intraoperatório. Não ocorreram isquemias.

Conclusão: O emprego de anestesia local para o tratamento cirúrgico da síndrome do túnel do carpo é eficaz para o procedimento e para o resultado final.

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Introduction

Carpal tunnel syndrome (CTS) is one of the diseases most frequently treated by orthopedists and hand surgery specialists and it is considered to be the commonest peripheral compressive neuropathy.^{1,2} This condition is responsible for substantial annual costs to society, both in terms of loss of these patients' productivity and in relation to the direct costs of treatment. In many cases, conservative treatment is ineffective and there is a need for surgical treatment.³

Traditional medical education contraindicates the use of adrenaline in anesthetic blockades of the extremities of the limbs, and this concept continues to be taught in medical schools and in traditional textbooks on surgery. Some studies have reported that there is a lack of consensus among hand surgeons regarding whether or not to use adrenaline at the extremities.⁴⁻⁶

Expenditure on medical treatments is increasing. In this light, there is immense concern with funding for this and alternative solutions are being sought.⁷⁻⁹ We believe that treatments that are proposed to patients need to be the most effective ones in terms of the functional and esthetic results, while also keeping the costs as low as possible. For this reason, we considered that the technique used by Lalonde for surgical treatment of CTS was of great interest.¹⁰⁻¹²

The objective of this study was to assess the results and complications from surgical treatment of CTS using an open route under local anesthetic composed of lidocaine, epinephrine and bicarbonate, as described by Lalonde et al.¹⁰

Materials and methods

For this study, 16 patients with CTS were selected. They had been diagnosed clinically through positive Durkan and Phalen tests, and through electromyography. All of these patients agreed to participate in this study and signed a consent statement for this. They were anesthetized and underwent surgery using the technique described by Lalonde, which is known as "hole-in-one carpal tunnel surgery". The day hospital system was used, which the patients were discharged just after the surgical procedure and no preoperative examinations were requested.

The technique has the aim of achieving longitudinal release of the transverse ligament of the carpus by means of an open route, with an access of around 3 cm above the region of the carpal tunnel (flexor zone 4), under local anesthesia alone, without sedation or any concomitant medication, and without a tourniquet. The idea is that the patient will only feel the first prick of the needle and should not feel any further pain or discomfort after this moment. The patient receives an infusion of 22 mL of an anesthetic solution by means of a 20 mL syringe (these syringes actually hold 22 mL) with a 30 mm × 0.7 mm needle. Initially, around 3-4 mL is infiltrated into the subdermal region of the distal portion of the forearm, between the paths of the median and ulnar nerves. Then, 8 mL is infiltrated into the subfascial layer of the distal portion of the forearm and the remaining 10 mL into the subdermal layer, anteriorly to the transverse ligament of the carpus.¹⁰ The approximate time taken for infiltration of all of the medication is around five minutes and care is required in order to keep the needle within a margin of 5 mm from the region that has already been anesthetized. During the infiltration of the solution, tissue tumefaction and skin pallor are observed, and this demonstrates penetration of the medication and tissue vasoconstriction. The solution that is infiltrated is composed of 20 mL of 1% lidocaine with epinephrine at 1:100,000 and 2 mL of 8.4% sodium bicarbonate. Because of the use of epinephrine, there is no need to apply a tourniquet.¹²

The patients were evaluated using the DASH score immediately before the operation and six months afterwards. The results from these 16 patients were expressed as the mean and standard deviation. The statistical analysis was performed using Student's t test. This study was properly approved by the Research Ethics Committee of the University of Oeste Paulista (UNOESTE) and all the participants signed a free and informed consent statement.

Results

Among the 16 patients, 13 (81%) were female and three (19%) were male. Their ages ranged from 34 to 72 years, with a mean of 52. In relation to the side on which the procedure was performed, 10 cases (63%) were on the right side and six (37%) on the left. Around 63% of the patients had activities that were predominantly home-based, such as working in their

Table 1 – Epidemiological data.

Patient	Sex	Age	Side operated	Dominance	Occupation	Length of time with symptoms (years)
1	F	54	R	R	Cleaner	5
2	F	34	R	R	Cleaner	4
3	M	53	L	L	Farm laborer	4
4	F	51	R	R	Caretaker	2
5	F	51	R	R	Homemaker	6
6	F	53	L	R	Cook	4
7	F	57	R	R	Homemaker	5
8	M	64	L	R	Handyman	2
9	F	48	R	R	Domestic service	3
10	F	59	R	R	Homemaker	3
11	F	43	R	R	Farm laborer	3
12	F	51	R	L	Handyman	6
13	F	72	L	R	Homemaker	6
14	F	49	L	R	Typist	4
15	F	42	R	R	Cleaner	4
16	M	52	L	R	Human resources analyst	10
Mean	F = 13 M = 3	52.063	R = 10 L = 6	R = 14 L = 2		4.4375

F, female; M, male; R, right; L, left.

own homes or doing domestic services or cleaning services. The length of time with symptoms ranged from two to ten years, with a mean of 4.43 (Tables 1 and 2).

Regarding the number of times that patients felt pain during the anesthesia, 12 (75%) reported feeling only one episode, while four (25%) reported two episodes, thus giving a mean of 1.25 times. Regarding the intensity of the pain during the anesthesia, 12 (75%) reported intensity 1, two (12.5%) intensity 2 and two (12.5%) intensity 8, with a mean intensity of 2. In comparison with the anesthesia used for a dental procedure, 13 (81%) reported that this technique was better and three (19%) that it was worse. In comparison with venous puncture, eight (50%) reported that this technique was better, four (25%) that it was worse and four (25%) that they were the same. In comparison with any other type of anesthesia, 12 (75%) reported that this technique was better, one (6%) that it was worse and three (19%) were unable to respond (Table 3). In no case was there any ischemia or necrosis.

In two cases, there were reports of intraoperative pain, which were both sudden and were promptly resolved. In one patient, there were symptoms of shock in the region of the ulnar nerve because the soft tissues had been pushed aside very brusquely, and in another patient there were symptoms in the region of the median nerve due to inadvertent pinching of the median nerve using tweezers.

Table 2 – Clinical characteristics of the patients.

Clinical characteristics	Patients (n = 16)
Duration of symptoms, in years (mean ± SD)	4 ± 2
Side affected, n (%)	
Right	10 (63)
Left	6 (37)
Dominant limb, n (%)	
Right	14 (88)
Left	2 (12)

The DASH questionnaire was applied to the patients before the operation and six months afterwards. Among the 16 patients, two did not come back for the postoperative evaluation (nos. 3 and 7). The preoperative DASH score ranged from 45 to 79.3, with a mean of 65.17. In the postoperative evaluation, we excluded the two patients who were missing. Among those who answered the questionnaire six months after the operation, the scores ranged from 1.66 to 37.5, with a mean of 16.53 (Table 4).

To ascertain the efficacy of the surgical treatment, we used the paired Student's t test, from which we obtained the value of 6.43. This rejected the null hypothesis with a confidence interval of 99%, with $p < 0.01$.

Discussion

The anesthetic and surgical method used in this study was based on the technique already used by Lalonde et al.,¹² in which a local anesthetic solution composed of lidocaine,

Table 3 – Characteristics of the anesthesia.

Characteristics of the anesthesia	Patients (n = 16)
Number of pain episodes (mean ± SD)	1.25 ± 0.4
Intensity of pain (mean ± SD)	2 ± 2.3
Dental procedure, n (%)	
Better	13 (81)
Worse	3 (19)
Venous puncture, n (%)	
Same	4 (25)
Better	8 (50)
Worse	4 (25)
Other anesthesia, n (%)	
Do not know	3 (19)
Better	12 (75)
Worse	1 (6)

Table 4 – Results from DASH score.

Patient	DASH before operation	DASH 6 months after operation
1	73.3	16.66
2	50.8	2.2
3*	65.8	NS
4	79.3	29.41
5	74.1	13.97
6	72.5	35.8
7*	53.3	NS
8	70	1.66
9	67.5	13.97
10	70.8	4.16
11	45	25
12	75.8	37.5
13	56.7	2.2
14	68.3	2.94
15	56.7	16.91
16	51.7	29.16
Mean	65.17857143	16.53857143
Standard deviation	10.81567087	
NS, no-show.		

epinephrine and bicarbonate was used, thus doing away with the need for a tourniquet or other anesthetic methods. The aim was to ascertain the results and risks from using local anesthetic that included epinephrine, in anesthesia of the extremities of the upper limbs, given that the teachings of the medical literature often make reference to the theory that vasoconstriction of the terminal arteries may induce ischemia and necrosis. On the other hand, the use of this drug has the advantage of increasing and prolonging the action of the anesthetic and providing a temporary hemostatic effect.¹² This technique differs from those traditionally used in that there is no need for a tourniquet at any time during the surgery, not even for a brief period.^{13,14}

Two reviews have been conducted: one published in 2001¹⁵ and the other in 2007.¹⁶ These searches for cases in which necrosis and ischemia of the fingers occurred subsequent to using local anesthesia with or without adrenaline, covering the period between 1880 and 2000. Among the 48 cases found, 27 occurred without use of adrenaline and 21 with its use. Among the latter, procaine was used in 18 cases, cocaine in two cases and an unknown anesthetic in one case. Not a single case of finger ischemia after combined use of lidocaine and epinephrine has been reported in the literature.^{15,16}

In Canada, more than 90% of operations to release the carpus are now performed under local anesthesia without sedation.¹⁷ Good results can be obtained, provided that the anesthetic and surgical techniques are used correctly. The local anesthetic in the skin is given time to act before any new skin puncture is made using a needle, and as little tissue as possible is pushed away in areas that have not been anesthetized. In our series, there were reports of intraoperative pain in two patients: one due to brusquely pushing the tissue away and the other due to pinching of the median nerve, i.e. through failures of the intraoperative technique. The waiting time now used between application of anesthetic and starting the surgical procedure is now at least 26 min, given that this

is the time during which adrenaline has its greatest efficacy and gives rise to least local bleeding.¹⁸

Conclusions

Surgical treatment of carpal tunnel syndrome using the local anesthetic procedure provided satisfactory clinical results. There is a need for a change in paradigm for surgeons, given that most of them are accustomed to conducting this procedure with the entire limb or organism anesthetized. A change in paradigm regarding use of adrenaline at the extremities is also needed, given that myths regarding its use have been ousted in the current literature.

Conflicts of interest

The authors declare no conflicts of interest.

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