WALANT in Carpal Tunnel Release. Comparative Study of Two Technical Variants in 89 Cases

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ABSTRACT

Objective: To evaluate the intraoperative and postoperative efficacy and comfort of two variants of anesthesia in two groups with carpal tunnel syndrome (CTS). **Materials and Methods:** Descriptive, comparative, retrospective, observational study using a 12-item telephone questionnaire on local anesthesia without a tourniquet. We included patients with CTS who underwent surgery between 2008 and 2019 with a mini-open approach and divided them into two groups: 1) 2% lidocaine plus 0.5% bupivacaine plus 1:200,000 epinephrine plus light sedation (n = 32) and 2) 2% lidocaine plus epinephrine 1:200,000 (n = 57). **Results:** 89 patients were evaluated (mean age 66.9 years). All patients were satisfied and confirmed they would choose this procedure again. There were no significant differences in comfort or the possible development of intra- or postoperative symptoms between the two groups. The postoperative stay was 1-3 hours; hospitalization was not required. The bleeding was minimal. **Conclusion:** Carpal tunnel release under local anesthesia with lidocaine + epinephrine, without a tourniquet, has proven to be a safe procedure with no complications. The patients did not complain of local immediate intraoperative or postoperative pain or pain at the site of the tourniquet. The stay in the healthcare facility was shorter. The short stay and the fewer elements used (anesthetics, tourniquet) imply a reduction in the costs of the procedure. Though the presence of an anaesthesiologist is recommended, the procedure can be performed in appropriate settings without one. We do not recommend its use without preoperative studies or outside the operating room.
Keywords: Hand; carpal tunnel syndrome; local anesthesia; epinephrine.
Level of Evidence: III

Anestesia local con epinefrina, sin manguito hemostático, para la liberación del túnel carpiano. Estudio comparativo de dos variantes técnicas en 89 casos

RESUMEN

Objetivo: Evaluar la eficacia intra y posoperatoria, y la comodidad para el paciente de dos variantes de la anestesia en dos grupos con síndrome del túnel carpiano. **Materiales y Métodos**: Estudio descriptivo, comparativo, retrospectivo, observacional mediante un cuestionario telefónico de 12 ítems sobre la anestesia local sin manguito. Se incorporó a pacientes con síndrome del túnel carpiano operados entre 2008 y 2019, mediante un miniabordaje abierto, y se los dividió en: grupo 1: lidocaína al 2% más bupivacaína al 0,5% más epinefrina 1:200.000 más sedación ligera (n = 32) y grupo 2: lidocaína al 2% más epinefrina 1:200.000 (n = 57). **Resultados:** Se evaluó a 89 pacientes (media de edad 66.9 años). Todos se mostraron satisfechos y confirmaron que volverían a elegir este procedimiento. No hubo diferencias significativas en la comodidad o el posible desarrollo de síntomas intra o posoperatorios entre ambos grupos. La permanencia posoperatoria fue de 1-3 h, sin hospitalización. El sangrado fue mínimo. **Conclusiones**: La liberación del túnel carpiano bajo anestesia local más epinefrina, sin manguito hemostático, resultó segura y sin complicaciones. Los pacientes no refirieron dolor local intraoperatorio ni posoperatorio inmediato, ni en el sitio del torniquete. La permanencia en el centro asistencial fue breve. La estancia corta y la menor cantidad de elementos empleados (anestésicos, manguito) implican una reducción de los costos del procedimiento. Si bien es recomendable la presencia de un anestesiólogo, puede llegar a realizarse en ámbitos adecuados sin él. No se recomienda su empleo sin estudios prequirúrgicos ni fuera del quirófano.
Palabras clave: Mano; síndrome del túnel carpiano; anestesia local; epinefrina.
Nivel de Evidencia: III

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How to cite this article: Poitevin L, Ferraguti MS. WALANT in Carpal Tunnel Release. Comparative Study of Two Technical Variants in 89 Cases. *Rev Asoc Argent Ortop Traumatol* 2022;87(6):789-797. https://doi.org/10.15417/issn.1852-7434.2022.87.6.1466

INTRODUCTION

In recent years, the use of epinephrine local anesthesia without the use of a hemostatic cuff has become popular for many ambulatory hand and wrist surgical procedures.[1] Epinephrine has also been shown to be safe at the digital level: a study evaluating a large number of digital blocks has refuted this concern as long as the concentration is more diluted than 1:100,000.[2] This technique is known as WALANT (*Wide Awake Local Anesthesia – No Tourniquet*). It allows the evaluation of the mobility and function of the fingers during surgery.

The main objective of this study was to evaluate patient comfort and the efficacy of this method of anesthesia during surgery and in the postoperative period, as well as its level of safety in carpal tunnel release procedures. In addition, two technical variants of local anesthesia with epinephrine were compared in two groups of patients, with different surgeons and in different institutions.

The hypotheses proposed were: 1) that the method offers benefits compared to what is observed with conventional methods (brachialgia due to the tourniquet does not appear, nor paresthesias secondary to regional anesthesia, nor ischemic or other complications; bleeding is minimal and it does not hinder surgery, a final hemostasis stage is not required, the surgical procedure lasts a short time, the patients are satisfied and the postoperative stay in the health center is short); 2) that there should be no significant differences between the two groups studied.

MATERIALS AND METHODS

A descriptive, comparative, retrospective, observational study was carried out. The population included two groups of patients diagnosed with carpal tunnel syndrome operated on between August 2008 and December 2019. The exclusion criteria were: age <18 years, previous carpal tunnel release treatment, unwillingness of the patient to consider this therapeutic option and previous adverse reactions to local anesthetics. The demographic characteristics recorded were: sex, age, affected hand, work activity (active or retired).

The 89 patients with carpal tunnel syndrome who underwent a palmar mini-incision were divided into: group 1 (n = 32), who were administered a mixture of lidocaine and bupivacaine with buffer, sedation by an anesthetist, and topical anesthetic solution during surgery, as described further below; and group 2 (n = 57), who received 20 cc of 2% lidocaine with epinephrine, without sedation, and without the participation of an anesthesiologist.

The patients gave their consent to answer a telephone questionnaire on the following items:

1) Did you feel pain when the needle was inserted, when the anesthetic fluid was injected, and during surgery (0-10 visual analog scale)?

2) Did you feel pain during the surgery which needed a reinforcement of anesthesia?

3) Did you feel short of breath?

4) Brachialgia (pain proximal to the elbow) intra or postoperatively,

5) Nausea, vomiting,

6) Need for hospitalization,

7) Need for care by third parties,

8) Timing of food intake

9) Postoperative medication,

10) Sleep quality,

11) Soiling of dressings,

12) Would you choose the same anesthesia?

Anesthetic technique

Before changing and placing the fields, the surgeon administers local anesthesia using an aseptic technique; this step allows time for the anesthesia and epinephrine to work.

Anesthetic solution

Group 1: 20 cc of 2% lidocaine plus 20 cc of 0.5% bupivacaine, both with epinephrine 1:200,000 plus 20 cc of saline solution plus 2 drops of epinephrine 1:1000 (1 ml ampoule with 1 mg epinephrine) plus 4 cc of 1 M sodium bicarbonate solution plus prior sedation with 0.5 mg midazolam by an anesthesiologist. Injection of approximately 40 cc of the mixture. During the intervention, gauze soaked in a mixture of 200 cc of physiological solution plus an epinephrine ampoule are used, which are placed on the tissues as an adjunct to hemostasis. Administration of light sedation by an anesthesiologist.

Group 2: 20 cc of 2% lidocaine with epinephrine, without sedation.

Skin puncture: 1 cm proximal to the proximal crease of the wrist, in the axis of the 3rd commissure, avoiding the superficial veins, with a 15/5 needle. Infiltration of 1 cc, 30-second wait.

Infiltration: proximally and distally, progressing the anesthesia before the needle. Needle change: 50/8, placed in the same orifice. Infiltration towards proximal, distal, medial and lateral (Figure 1).

Figure 1. Proximal injection with 50/8 needle.

More distal puncture, if necessary, to complete the infiltration. The skin should be ischemic (white) (Figure 2).

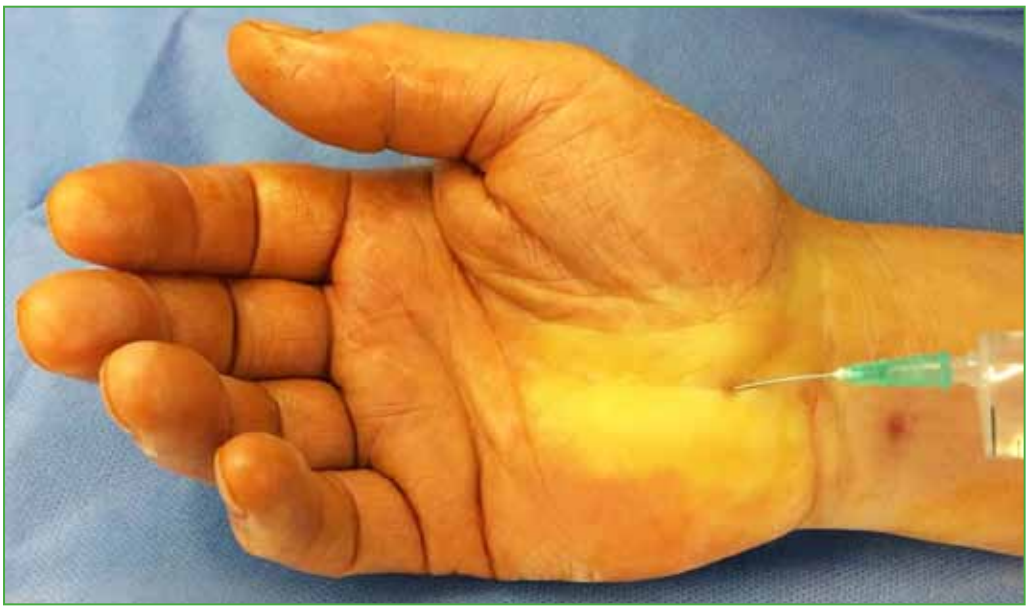

Figure 2. Distal injection with 50/8 needle. Note the skin ischemia.

In both groups, the technical details indicated by Lalonde were followed:

a. Insertion of the needle perpendicular to the skin.

b. Subdermal wheal (not intradermal) 1 cc and wait 30 seconds.

c. Slow needle progression causing the anesthetic to precede the needle.

d. Injecting a large volume of anesthetic fluid (principle of tumescence).

e. Waiting 30 min to start surgery in order to obtain maximum vasoconstriction, as recommended by McKeey et al.[3] Meanwhile, the surgical team washes, changes, and drapes.

Surgical technique

A 3 cm incision is made, distal to the distal crease of the wrist, in the axis of the 3rd commissure. The distal edge of the flexor retinaculum is identified. The entire retinaculum is sectioned, including the distal antebrachial fascia, following the ulnar border of the palmaris minor tendon (Figure 3).

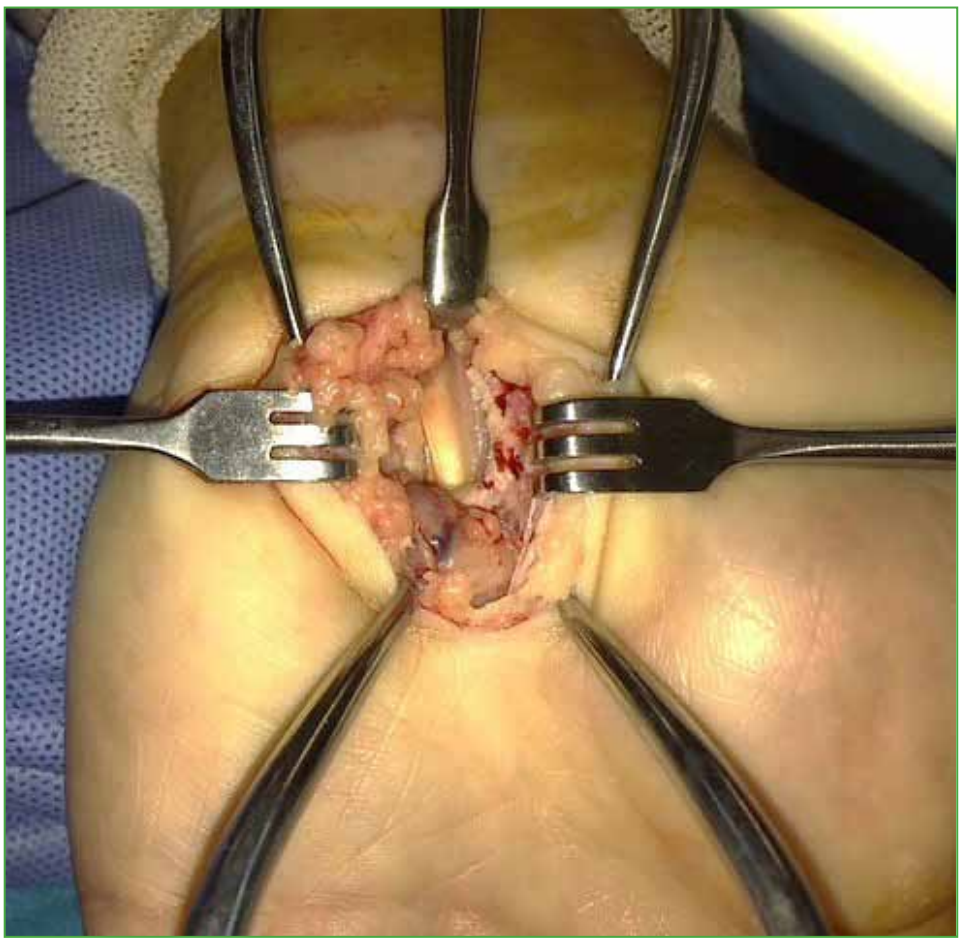

Figure 3. Decompressed median nerve. Note the skin ischemia and the bloodless field.

Statistical Analysis

A two-tailed Student's t test for independent data and the Mann-Whitney U test were used. A p-value <0.05 was considered statistically significant.

RESULTS

89 patients with carpal tunnel syndrome were evaluated. The demographic characteristics of each study group were comparable (Table 1). No statistically significant differences were observed in the demographic variables, with the exception of work activity. The affected hands were 21 right and 11 left in group 1, and 37 right and 20 left in group 2. The patients were 23 men and 66 women, with a mean age of 66.9 years (range 21-90); the predominant age ranged between the sixth and seventh decades of life.

Table 1. Demographic characteristics of the groups.

	Group 1 n (%)	Group 2 n (%)	Total	p
Sex				0.38
Male	10 (31.2)	13 (22.8)	23	
Female	22 (68.8)	44 (77.2)	66	
Age (mean), years	67.5	66.81	66.97	0.4
Affected hand				0.94
Left	21 (65.7)	37 (64.9)	58	
Right	11 (34.3)	20 (35.1)	31	
Work activity				0.007
Active	25 (78.2)	28 (49.1)	53	
Retired	7 (21.8)	29 (50.9)	36	

All patients reported being satisfied with the anesthetic procedure. The pain intensity evaluated by the visual analog scale (Figure 4 and Table 2) was higher in group 2, with statistical significance. The mean response to pain during the introduction of the needle was 0.94 ± 1.24 in group 1 and 1.63 ± 3.03 in group 2 (p = 0.006) and, during the injection of the liquid, it was of 0.62 ± 1.15 in group 1 and 1.91 ± 1.54 in group 2 (p = 0.004). Lastly, the pain score during surgery was 0.16 ± 1.24 in group 1 and 1.91 ± 1.54 in group 2 (p = 0.001).

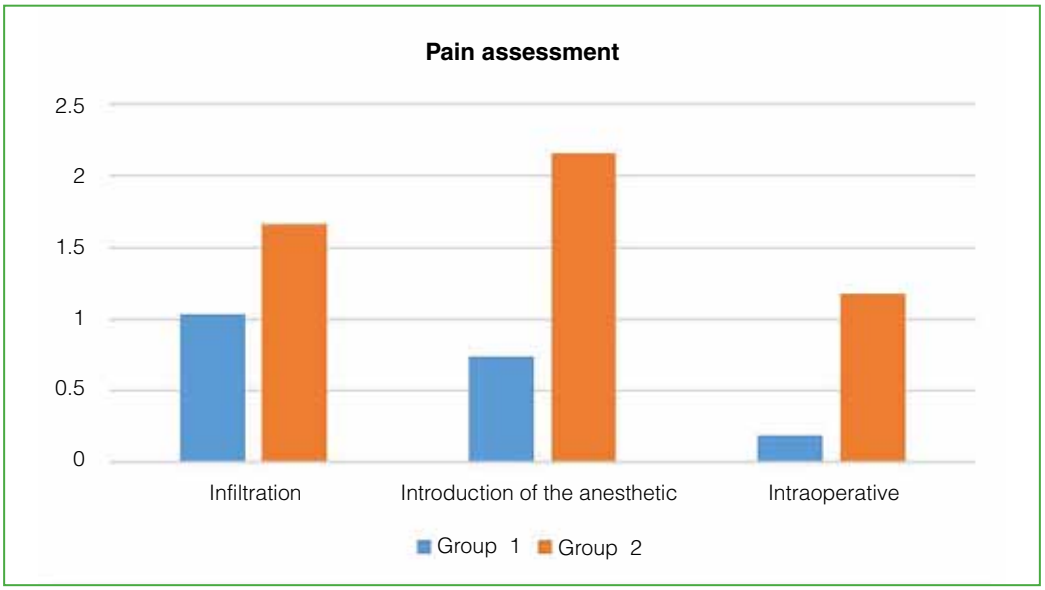

Figure 4. Comparison of pain assessment in three different situations.

Table 2. Statistical analysis

			Group 1			Group 2	
Pain (VAS)	Mean	SD	95%CI	Mean	SD	95%CI	p
Infiltration	0.94	1.24	0.49-1.38	1.63	3.03	0.82-2.43	0.006
Introduction of the anesthetic	0.62	1.15	0.2-1.04	1.91	1.54	1.5-2.31	0.004
Intraoperative (h)	0.16	1.24	0.29-0.64	1.91	1.54	1.5-2.31	0.001
Food intake (h)	6.75	2.88	5.71-7.78	6.57	2.53	5.97-7.17	0.37

VAS = visual analog scale; SD = standard deviation; 95% CI = 95% confidence interval.

There were no statistically significant differences between both groups in the possible development of intra- or postoperative symptoms. Postoperative food intake was 6.75 ± 2.88 h in group 1 and 6.57 ± 2.53 h in group 2 (p = 0.37). No patient required hospitalization and the stay in the healthcare center after surgery ranged from 1 to 3 hours (Table 3). There were no ischemic complications. Bleeding was minimal and did not hinder the surgical procedure.

Most of the patients studied did not report complications in the immediate postoperative period, except one from group 2 who suffered brachialgia and one from group 1 who reported nausea (Table 3).

81.25% of group 1 and 87.72% of group 2 required postoperative medication (p = 0.4). 96.88% of group 1 and 98.25% of group 2 reported that sleep quality was good (p = 0.67).

Almost all the members of group 1 (except one) confirmed that they would choose this procedure instead of general anesthesia or a regional block, which gave 96.9% of positive responses, compared to 100% in group 2 (p = 0.27).

Table 3. Comparison of symptoms and other items

	Group 1	Group 2	p
Dyspnea	0%	0%	
Brachialgia	0%	1.75% (1)	
Hospitalization	0%	0%	
Care by relative	3.13% (1)	0%	
Nausea, vomiting	3.13% (1)	0%	
Postoperative medication	81.25% (26)	87.72% (50)	0.4
Sleep quality	96.88% (31)	98.25% (56)	0.67
Same anesthesia	96.8% (31)	100%	0.27

DISCUSSION

In 1979, Lichtman et al.[4] were one of the first authors to publish their results with local anesthesia for the release of the carpal tunnel under a tourniquet, without sedation. The results as an outpatient procedure were satisfactory in 93 patients.

Lalonde[5] has been the author who most disseminated the use of WALANT in hand surgery. This author stated that the cases of digital necrosis described above were caused by procaine and not by epinephrine.

A survey of members of the *American Society for Surgery of the Hand* conducted by Duncan et al.[6] revealed that 2.4% of those surveyed exclusively used general anesthesia and 19.9% used regional anesthesia in all their patients. The use of general anesthesia would have greatly increased the costs of the procedure in the hospital.

There were no ischemic complications in either group, although anesthesia was not applied to the fingers, due to the nature of the surgical procedure. Also, by not using a hemostatic cuff and avoiding regional block or general anesthesia, the procedure was simplified and the discomfort of paresthesias usually described with axillary or supraclavicular block was not produced.

In a randomized comparative case-control study evaluating lidocaine injection with or without the use of a tourniquet for hemostasis in patients undergoing bilateral release, Braithwaite et al.[7] demonstrated that intraoperative pain could be up to twice as intense with the use of a tourniquet than with only local infiltration plus epinephrine. They used a visual analog scale to measure intraoperative pain and obtained scores of 4.7 with the use of a tourniquet and 2.2 without a tourniquet (haemostasis by infiltration of xylocaine plus adrenaline) ($p < 0.01$). Ralt et al.[8] published similar conclusions.

Coinciding with Braithwaite et al.,[7] since in the local anesthesia procedure performed in this study only lidocaine, alone or associated with bupivacaine, is used, in both cases with epinephrine (as administered in dental offices around the world), the comorbidities of the patients are rarely a concern.

Post-anesthetic recovery was rapid, although only the patients in group 1 of our study received sedation and, in the other group, there was no anesthesiologist. This modality was forced by the lack of an anesthesiologist in each of the operating rooms of the corresponding public hospital. However, there was an anesthesiologist in the adjacent operating rooms. It is understood that there may be objections from the medico-legal point of view. For this reason, it is considered that the ideal is to have an anesthesiologist in the operating room.

Contrary to Lalonde's recommendation,[9] we consider that it would not be advisable to carry out these interventions in outpatient clinics, nor to dispense with previous studies of surgical risk.

Gordley and Basu[10] reported that lidocaine with epinephrine contains acidic preservatives that produce a pH of 3.5 to 4.5 and plain lidocaine has a pH of 6.5 to 6.8. Therefore, the use of lidocaine (especially with epinephrine) often requires buffering with sodium bicarbonate to minimize the burning sensation. Regarding the statistical

comparison between the two groups analyzed in this study, the buffering effect of 1cc of 1M sodium bicarbonate solution every 10cc of lidocaine plus bupivacaine in group 1 could presumably decrease the pain of anesthetic agent injection.

The impact of sedation administered by an anesthesiologist in group 1 could also explain the significant difference in pain during the injection and the surgical procedure between the two groups. In any case, in group 2, the main value of pain on the visual analog scale was 1.91, which is significantly low.

There were no significant differences between the two groups, except in the pain item.

Regarding the form of administration of the solution, the technique described by Lalonde and Wong was used, as already indicated.[11]

It should be noted that the analysis of long-term surgical results is not the objective of this study.

The procedure of carpal tunnel release under local anesthesia with lidocaine plus epinephrine and the optional addition of bupivacaine and sodium bicarbonate buffer, without a tourniquet, has been shown to be safe and cause no complications. The addition of bupivacaine is recommendable, although when our two groups were compared, anesthesia did not last longer with said addition.

The anesthesia time is similar to or less than that of a general or regional anesthesia and, as in conventional anesthesia, it is performed before placing the fields. As the bleeding is minimal, it does not prolong the surgery and does not require additional hemostasis time to release the tourniquet.

Thus, this anesthetic procedure makes it possible to avoid both more invasive anesthesia and the discomfort of the tourniquet without causing ischemic complications or excessive bleeding. However, one of the limiting factors of our study is the lack of a control group with patients operated on for carpal tunnel syndrome in whom a tourniquet was used to compare the results. Therefore, estimates of this type are qualitative and based on published studies and the authors' personal experience with conventional anesthesia.

Not using a tourniquet, Esmarch® bandage, or ultrasound device to guide the regional block and having a shorter estimated duration of the procedure in comparison to conventional methods—because the anesthetic procedure takes less time and no additional hemostasis time is necessary as it happens when releasing the tourniquet— imply a reduction in costs. Although the presence of an anesthesiologist is recommended, it could be performed in suitable settings without this professional. Its use is not recommended without pre-surgical studies or in settings outside the operating room.

Bleeding was minimal and visualization of the surgical field was very good, which did not prolong surgery time. The benefits for the patients were not suffering immediate intra- or postoperative local pain or in the usual tourniquet site. Likewise, a shorter stay in the healthcare center was qualitatively noted compared to the usual stay after procedures with regional block or general anesthesia.

Conflict of interest: The authors do not declare conflicts of interest.

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