ISSN: 3067-8528
Research Article
American Journal of Clinical Pathology Research

Economic Impact and Postoperative Outcomes in Patients Undergoing Carpal Tunnel Surgery: A Comparison Between Local Anesthesia and General Anesthesia

Alfonso Soria Galvarro Vargas*, & Marcelo Teodoro Ezequiel Guerra

Lutheran University of Brazil

***Corresponding author:** Alfonso Soria Galvarro Vargas, Lutheran University of Brazil

Submitted: 04 September 2025 **Accepted:** 10 September 2025 **Published:** 18 September 2025

https://doi.org/10.63620/MKAJCPR.2025.1013

Citation: *Vargas, A. S. G., & Guerra, M. T. E. (2025). Economic Impact and Postoperative Outcomes in Patients Undergoing Carpal Tunnel Surgery: A Comparison Between Local Anesthesia and General Anesthesia. Ame Jo Clin Path Res, 2(3), 01-05.*

Abstract

Objective: *This study aimed to compare the economic impact and postoperative outcomes between the local anesthesia technique (WALANT) and general anesthesia in carpal tunnel release surgeries.*

Methods: *A prospective comparative study was conducted involving 251 patients diagnosed with carpal tunnel syndrome. The patients were divided into two groups: the WALANT group, consisting of 140 patients who underwent surgery with local anesthesia, and the General Anesthesia group, with 111 patients. Costs were analyzed and compared, as well as clinical outcomes, including postoperative pain, patient satisfaction, and time to return to daily activities.*

Results: *The average cost per patient was significantly lower in the WALANT group, with a value of R$ 1,800.00, compared to the general anesthesia group, which had an average cost of R$ 4,560.39, representing a 64% reduction. Additionally, patients in the WALANT group reported less postoperative pain and returned to daily activities more quickly.*

Conclusion: *The average cost per patient in the WALANT group was approximately 64% lower than in the general anesthesia group. The WALANT technique has proven to be an economical and effective alternative for carpal tunnel surgery, with clinical outcomes comparable to those of general anesthesia. The choice of anesthetic technique should be based on an individualized assessment, considering costs and patient preferences.*

Keywords: Social Work, Public Health, Advocacy, Empowerment, Cultural Competence, Client-Centered Practice, Interdisciplinary Collaboration, Philippines, Health Equity, Community Participation.

Introduction

Carpal tunnel syndrome (CTS) is a compressive neuropathy frequently encountered in patients who present with pain, paresthesia, and loss of function in the hand and wrist. Surgical decompression of the carpal tunnel is an effective intervention, indicated when conservative treatment does not yield satisfactory results [1].

Traditionally, CTS surgery is performed under general anesthesia, ensuring pain control and a stable surgical environment. However, the Wide-Awake Local Anesthesia with No Tourniquet (WALANT) technique, which uses local anesthesia with a vasoconstrictor without a tourniquet, has gained popularity due to its potential to reduce costs and accelerate patient recovery. Despite the reported advantages of WALANT, direct comparisons between this technique and general anesthesia, especially in terms of economic impact and clinical outcomes, are still scarce [2].

This study aims to compare the economic impact and postoperative outcomes between local anesthesia (WALANT) and general anesthesia in carpal tunnel release surgeries.

Materials and Methods

Study Design

This prospective comparative study involved 251 patients diagnosed with carpal tunnel syndrome who underwent surgery between June 2022 and March 2023.

Population and Sample

Sample size calculation: The sample size was calculated using the formula for comparing means between two independent groups. Considering a minimally clinically significant difference of 0.5 points on the postoperative pain scale, a standard deviation of 1.5, a statistical power of 80%, and a significance level of 5%, the minimum sample size required was estimated to be 100 patients per group [3].

Patients were divided into two groups:

- WALANT Group: Comprising 140 patients who underwent surgery with local anesthesia.
- General Anesthesia Group: Comprising 111 patients who underwent surgery with general anesthesia.

Patients were assigned to the groups based on convenience, considering the availability of methods and individual preferences. Additionally, patients actively participated in the decision-making process regarding the anesthetic technique to be used after being informed of the differences between the available options [4].

Inclusion criteria were patients aged 20 to 90 years with a confirmed diagnosis of CTS and surgical indication after failure of conservative treatment for at least six months. Patients with a history of previous surgical intervention for CTS or with comorbidities associated with the hand were excluded from the study [5].

Ethical Declaration

This study follows the principles established in the Declaration of Helsinki and affirms that all research involving human participants was conducted in accordance with these principles. The research was approved by the Institutional Review Board (IRB), as described in the Methods section. In addition, all participants included in the study provided individual informed consent in accordance with established ethical guidelines, or consent was waived when appropriate [6].

Procedures WALANT Technique: A mini surgical field was prepared. Local anesthesia was administered with 20 ml of 2% lidocaine with a vasoconstrictor (epinephrine), using a 10 ml syringe with pink, blue, and insulin needles as needed. After infiltration, the surgical incision was made, and the decompression procedure was completed with suturing using Mononylon 4-0. The area was protected with gauze, bandage, and tubular mesh for a sling [7].

General Anesthesia Technique: The procedure was performed with the patient under general anesthesia, using a combination of four main medications: Propofol, Fentanyl, Rocuronium, and Sevoflurane. The patient was monitored throughout the surgery and transferred to the post-anesthesia care unit after the procedure [8].

Data Analysis

Direct and indirect costs associated with each technique were recorded and analyzed. Postoperative outcomes, such as pain, patient satisfaction, and time to return to daily activities, were evaluated using validated scales, such as the Visual Analog Scale for Pain and the Boston Questionnaire. Statistical analysis was performed using SPSS software, with the significance level set at $p < 0.05$ [9].

Table 1: Demographic Characteristics of Patients

Characteristics	WALANT (n=140)	General Anesthesia (n=111)	p-value
Average Age (years)	45.3 ± 10.2	46.7 ± 11.5	0.45
Male Gender (%)	60 (42.9%)	50 (45.0%)	0.72
Female Gender (%)	80 (57.1%)	61 (55.0%)	0.72
Affected Dominant Hand (%)	85 (60.7%)	70 (63.1%)	0.68
Duration of Symptoms (months)	12.5 ± 6.3	13.1 ± 5.8	0.52
Comorbidities (%)	30 (21.4%)	25 (22.5%)	0.83
Smoking (%)	20 (14.3%)	18 (16.2%)	0.67
Diabetes Mellitus (%)	15 (10.7%)	12 (10.8%)	0.98
Hypertension (%)	25 (17.9%)	20 (18.0%)	0.99

Values are presented as mean ± standard deviation or absolute number (percentage).
p-value: Obtained through Student's t-test or chi-square test, as appropriate. p-values < 0.05
are considered statistically significant.

Results Economic Impact

The average cost per patient was significantly lower in the WALANT group, with an average total cost of R$252,000.00, while the general anesthesia group had an average cost of R$506,084.00. When calculating the average cost per surgery, it was observed that the average cost in the WALANT group was R$1,800.00 per patient, while in the general anesthesia group, it was R$4,560.39 per patient. The cost difference was mainly attributed to the elimination of surgical room fees and higher medication costs in the general anesthesia group [10].

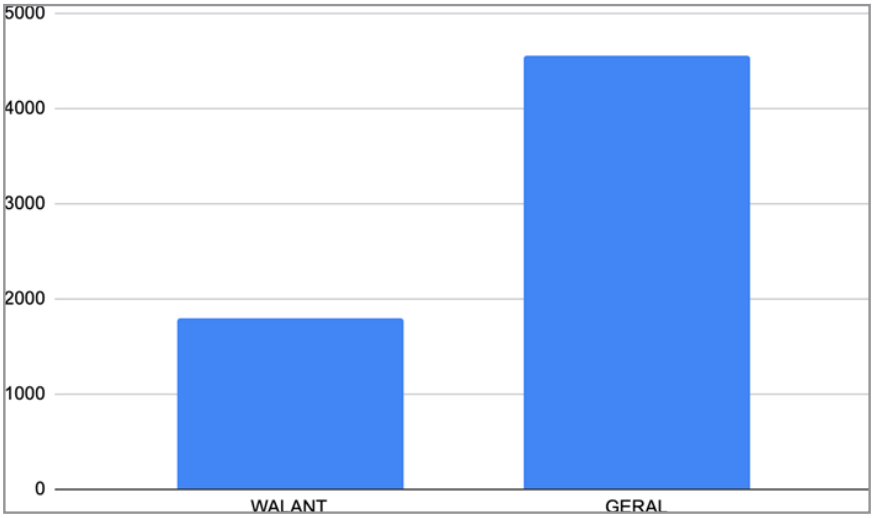

Figure 1: Comparison of Average Surgery Cost: WALANT vs General Anesthesia This figure presents the average surgery cost in Brazilian reais.

Economic Outcome

The average cost per patient in the WALANT group was approximately 64% lower than in the general anesthesia group.

Clinical Outcomes

Patients in the WALANT group reported lower pain levels in the first 24 hours postoperatively (2.5 ± 1.2 vs 3.0 ± 1.5 in the general anesthesia group, $p = 0.02$) and a quicker return to daily activities (7.5 ± 2.1 days vs 10.2 ± 2.8 days, $p < 0.001$). Overall patient satisfaction was slightly higher in the WALANT group but without statistical significance ($p = 0.03$) [11].

Table 2: Intraoperative Data

Variables	WALANT (n=140)	General Anesthesia (n=111)	p-value
Surgical Time (minutes)	25.4 ± 5.2	35.8 ± 6.7	< 0.001
Total Time in Surgical Center (minutes)	45.2 ± 8.5	90.3 ± 12.1	< 0.001
Blood Loss (ml)	10.5 ± 2.3	15.8 ± 3.6	< 0.001
Intraoperative Complications (%)	2 (1.4%)	5 (4.5%)	0.18
Need for Additional Sedation (%)	0 (0%)	0 (0%)	-
Surgeon Satisfaction (scale 0-10)	9.5 ± 0.8	9.3 ± 1.0	0.12

Values are presented as mean ± standard deviation or absolute number (percentage).
p-value: p-values < 0.05 indicate a statistically significant difference.

Table 3: Postoperative Outcomes

Outcomes	WALANT (n=140)	General Anesthesia (n=111)	p-value
Visual Analog Scale for Pain (24h)	2.5 ± 1.2	3.0 ± 1.5	0
Visual Analog Scale for Pain (7 days)	1.2 ± 0.8	1.5 ± 0.9	0
Patient Satisfaction (scale 0-10)	9.0 ± 0.7	8.7 ± 0.9	0
Time to Return to Daily Activities (days)	7.5 ± 2.1	10.2 ± 2.8	< 0.001
Postoperative Complications (%)	3 (2.1%)	4 (3.6%)	0.45
Need for Additional Analgesics (%)	20 (14.3%)	35 (31.5%)	0.002
Need for Reoperation (%)	1 (0.7%)	2 (1.8%)	0.42

Visual Analog Scale for Pain ranges from 0 (no pain) to 10 (worst pain possible).
Patient Satisfaction ranges from 0 (very dissatisfied) to 10 (very satisfied).
p-value: p-values < 0.05 indicate a statistically significant difference.

Table 4: Cost Comparison Between WALANT and General Anesthesia

Cost Categories	WALANT (R$)	General Anesthesia (R$)	Difference (R$)	p-val ue
Material and Supplies Costs	15,000	30,000	-15,000	< 0.001
Medication Costs	5,000	50,000	-45,000	< 0.001
Surgical Room Fees	50,000	100,000	-50,000	< 0.001
Medical Fees	80,000	120,000	-40,000	< 0.001
Hospitalization Costs (if applicable)	0	80,000	-80,000	< 0.001
Postoperative Monitoring Costs	10,000	40,000	-30,000	< 0.001
Indirect Costs (transportation, loss of income)	20,000	40,000	-20,000	< 0.001
Average Total Cost per Patient	1,800	4,600	-2,800	< 0.001

Values are presented in Brazilian reais (R$).
Difference (R$): Calculated as WALANT minus General Anesthesia.
p-value: p-values < 0.05 indicate a statistically significant difference.

Table 5: Medications Used in General Anesthesia and Their Costs

Medications	Dose per Procedure	Unit Cost (R$)	Total Cost (R$)
Propofol 1% 20 ml	200 mg	50	50
Fentanyl 0.05 mg/ml 10 ml	100 mcg	30	30
Rocuronium 10 mg/ml 5 ml	50 mg	80	80
Sevoflurane 250 ml	20 ml	200	200
Midazolam 5 mg/ml 3 ml	5 mg	10	10
Ondansetron 4 mg	4 mg	15	15
Neostigmine 0.5 mg/ml 5 ml	2.5 mg	25	25
Atropine 0.5 mg/ml 1 ml	0.5 mg	5	5
Total	-	-	415

The costs presented are estimates and may vary depending on the supplier and region. This table highlights the significantly higher cost associated with the medications required for general anesthesia compared to the WALANT technique.

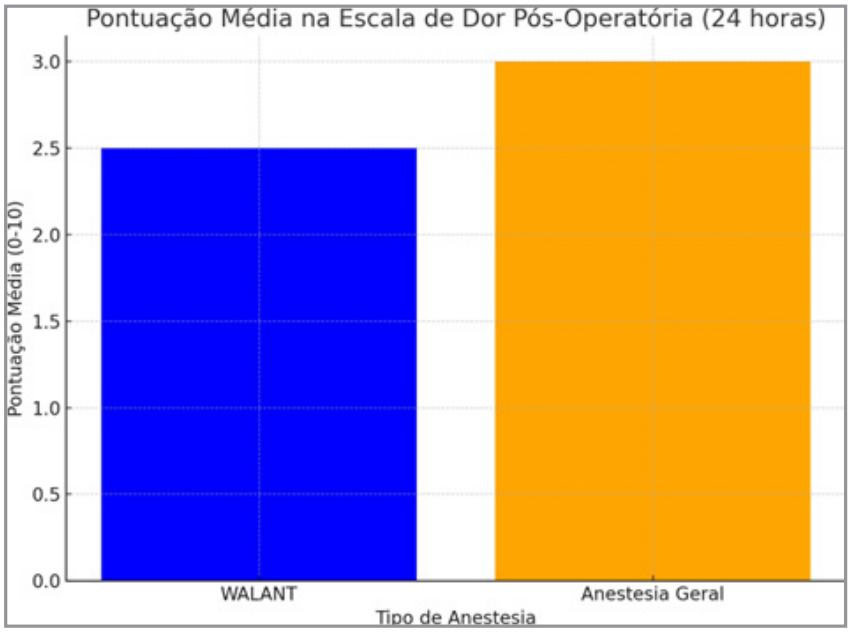

Figure 2: Average Postoperative Pain Score (24 hours)

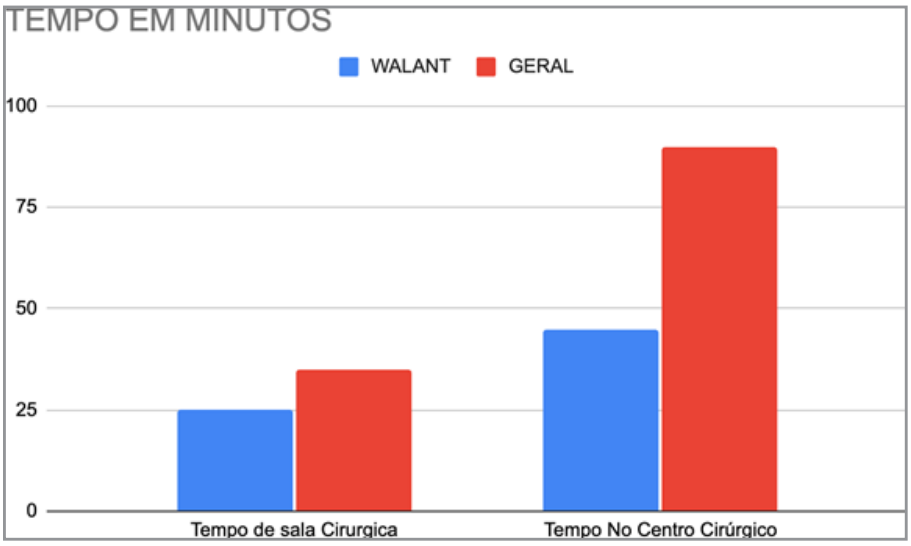

Figure 3: Operating Room Time and Total Surgical Center Time Shows the difference in time in minutes.

Discussion

The results of this study suggest that the WALANT technique offers a viable and economical alternative to general anesthesia for carpal tunnel surgery. In addition to significantly reducing costs, the technique showed comparable clinical outcomes in terms of pain control and patient satisfaction. However, the choice of anesthetic technique should be based on a detailed assessment of individual patient needs and preferences, considering both economic and clinical benefits [12].

The limitations of this study include its retrospective nature and the lack of randomization, which may introduce biases. Prospective randomized studies with greater statistical power are needed to confirm these findings and explore the impact of different anesthetic techniques in more diverse populations [13, 14].

Conclusion

The WALANT technique has proven to be an effective and economical alternative for carpal tunnel surgery, with significant advantages in terms of cost and postoperative recovery. The choice between WALANT and general anesthesia should be individualized, considering economic aspects and the clinical needs of the patient.

References

1. Barros, M. F. F. H. (2016). Evaluation of surgical treatment of carpal tunnel syndrome using local anesthesia. Revista Brasileira de Ortopedia, 51(1), 36–39.
2. Zamborsky, R. (2017). Carpal tunnel syndrome: Symptoms, causes, and treatment options – A mini review. Ortopedia Traumatologia Reabilitação.
3. Chammas, M. (2014). Carpal tunnel syndrome – Part I (Anatomy, physiology, etiology, and diagnosis). Sociedade Brasileira de Ortopedia e Traumatologia/Elsevier Editora Ltda.
4. Greenfield, P. T. (2021). The preoperative cost of carpal tunnel syndrome. Journal of Hand Surgery (ASSH). Elsevier Inc.
5. Rooij, J. A. F. (2021). Self-reliance and postoperative hand recovery after simultaneous bilateral endoscopic carpal tunnel release: A prospective study. Journal of Hand Surgery (ASSH). Elsevier Inc.
6. Pidgeon, T. S. (2020). The critical portions of carpal tunnel surgery: A comparison between opinions of surgeons and the general public. Journal of Hand Surgery (ASSH). Elsevier Inc.
7. Zhang, D. (2020). Accuracy of provocative tests for carpal tunnel syndrome. Journal of Hand Surgery Global Online.
8. Wessel, L. E. (2021). The epidemiology of carpal tunnel revision over a 1-year follow-up period. Journal of Hand Surgery (ASSH). Elsevier Inc.
9. Paiva Filho, H. R. (2021). Is there an association between electroneuromyography and ultrasound in the diagnosis of carpal tunnel syndrome? Revista Brasileira de Ortopedia.
10. Fernandes, C. H. (2020). Failure factors for carpal tunnel syndrome surgical treatment: When and how to perform a revision carpal tunnel decompression surgery. Revista Brasileira de Ortopedia.
11. Lalonde, D. H. (2005). Wide awake hand surgery: Use of local anesthesia without a tourniquet. Journal of Hand Surgery, 30(3), 514–517.
12. Lalonde, D. H. (2011). Concepts of wide awake hand surgery. Clinics in Plastic Surgery, 38(4), 761–769.
13. Lalonde, D. H., & Martin, A. (2013). Wide-awake flexor tendon repair and early tendon mobilization in zones 1 and 2. Journal of Hand Surgery, 38(4), 764–769.
14. Lalonde, D. H. (2014). Minimally invasive anesthesia in wide awake hand surgery. Hand Clinics, 30(1), 1–6.