http://jmscr.igmpublication.org/home/
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v11i10.08

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Assessing the efficacy of medical vs surgical approaches for treating carpal tunnel syndrome: Systematic review

Authors
Dr Ahmed Elhamalawy[1], Dr Muataz Khalid[2]
[1,2]MRCGP UK

Abstract

Background: *Carpal tunnel syndrome (CTS) is the most common peripheral nerve entrapment syndrome that is caused by compression of the median nerve at the wrist joint causing variety of signs and symptoms. There are several measures to treat CTS including surgical and non-surgical approaches.*

Objectives: *this systematic review aims to compare and evaluate the efficacy of conservative (non-surgical) and surgical approaches in treatment of CTS.*

Methods: *Using predefined keywords related to this condition, an extensive search of medical databases, including PubMed and Cochrane library, was carried out to find and select randomized controlled clinical trials evaluating the effects of conservative treatment compared to surgical treatment released up to August 2023. The quality of the included research was rigorously evaluated, and data were extracted. After reviewing pertinent papers for relevance and quality, data was gathered for analysis. Key outcome measures included pain reduction and functional improvement*

Results and Discussion: *Through an extensive search of databases, six relevant randomized controlled trials (RCTs) were finally identified. The analysis demonstrates that CTS patients benefit from both conservative treatments and surgical approaches, with surgical interventions showing immediate and significant symptom alleviation. Conservative therapy, on the other hand, led to relatively moderate results. Long-term results and patient satisfaction seemed to favor surgical procedures. The review highlights trade-offs between various treatment modalities and offers insights for clinical decision-making. Long-term impacts, patient preferences, standardized outcome measurements, and cost-effectiveness analyses should all be the main topics of future research. Finally, this analysis contributes to the development of evidence-based management approaches, assisting professionals in enhancing care for CTS patients in primary care settings.*

Conclusion: *surgery demonstrate immediate and considerable symptom alleviation and functional improvement more than conservative treatment mainly with severe CTS and for long term effect.*

Introduction

Carpal Tunnel Syndrome (CTS) is a common wrist and hand disorder caused by the median nerve's squeezing in the carpal tunnel. The wrist bones and a strong ligament create the tiny carpal tunnel. Pain, numbness, tingling, and weakness

may occur due to this condition in the hand and fingers. Activities requiring repeated wrist motions or prolonged flexion might aggravate these problems.[1]

Gender, age, physical demands at work, and certain medical disorders, including obesity, diabetes and rheumatoid arthritis, all increase the possibility of developing CTS. Women, especially during pregnancy and menopause of are at more risk of developing this condition[2]. The risk is further raised by occupations that call for frequent wrist motions or vibrating instruments for extended periods[3]. Symptoms of CTS can include numbness or tingling that occurs in the thumb, index, middle, and half of the ring finger with possible weakness of the hand that could cause difficulty to grip small objects or difficulty in using fine motor skills. Pain is another feature typically found in the hand and wrist and sometimes radiate up the forearm. These symptoms are often worse at night[4]

Knowing the causes, risk factors, and symptoms of CTS is essential for proper diagnosis and treatment because of the widespread nature of the condition and its potential impact on everyday life. We want to learn more about the efficacy of conservative therapy such as wrist splinting, physical therapy, and medications, against surgical interventions like carpal tunnel release surgery in terms of relieving symptoms and improving hand function.

Research Question and rationale for review

CTS is a common and often debilitating condition that affects a significant portion of the population. It is crucial to determine the most effective and appropriate management strategies to improve patient outcomes, reduce pain, and enhance overall quality of life. There is considerable variability in the management of CTS, with some patients initially seeking care from primary care providers, while others are referred to specialists for surgical evaluation. Understanding the outcomes and effectiveness of primary care-based conservative treatments versus surgical interventions is essential for optimizing patient care pathways. it is imperative to synthesize the existing body of evidence on CTS management comprehensively. This review aims to provide a clear, up-to-date, and evidence-based overview of the comparative effectiveness of conservative and surgical treatments aiding healthcare professionals in making informed decisions to improve patients' management outcome. we would like to search for evidence about whether non-surgical treatments for carpal tunnel syndrome is just as successful as surgical ones by conducting this comparative analysis.

Methodology

Inclusion and exclusion criteria

Strict inclusion and exclusion criteria have been established to guarantee that only applicable papers are selected for this systematic literature review.

Inclusion criteria

1. Studies directly evaluating and comparing surgical and non-surgical care for CTS.
2. Randomized controlled trails (RCTs) were only assessed.
3. Studies involving adults (18+) with a confirmed diagnosis of CTS.
4. Quantitative studies assessing changes in symptoms, functionality and quality of life.
5. Studies were published in English.

Exclusion criteria

1. Studies that do not directly compare non-surgical treatments with surgical procedures.
2. Studies exclusively considers pathophysiology or diagnostic techniques without considering treatment outcome
3. Studies that appear in media other than English
4. Studies whose results can't be trusted because of inadequate data or other methodological issues.

Search Strategy

In order to find relevant papers, a thorough search strategy was performed across key databases namely PubMed and Cochrane Library. Few keywords were used to identify needed articles: Carpal tunnel syndrome, Median nerve compression, Surgical intervention & non-Surgical intervention. The search strategy will combine these keywords and criteria in a methodical manner. Preliminary information was gathered via database search interfaces, and then transferred to citation management software for more thorough analysis. To ensure that pertinent studies are included, filters were used to limit the search results to articles released within the last 10 years.

Study selection process

After search technique to the selected databases were applied, the resulting studies were screened first using the titles and abstracts. Studies were disqualified if they did not match the inclusion criteria or are irrelevant. Full text evaluation was followed, retrieve and read the whole contents. The process of data extraction and data synthesis was done at this stage. This has included information on the participants, interventions, outcomes, and results of the research, as well as any pertinent statistical data. To maintain uniformity, use standardized data extraction forms. A narrative synthesis approach was employed to analyze the findings from the included studies. Further assessment of the risk of bias within the included studies was conducted.

The research selection method strives to guarantee a high quality of evidence by concentrating on randomized controlled trials to compare the efficacy of conservative treatments and surgical approaches for carpal tunnel syndrome in the primary care setting. Taking these steps helps reduce the possibility of bias and improves the overall quality of the review.

Initial Search Results

Screening Process (Title/Abstract, Full-Text)

The screening process involved two stages: title/abstract screening and full-text review.

1. **Title/Abstract Screening:** From the search strategy, 459 potentially relevant studies were identified and 252 duplicate papers were removed after checking titles and abstracts. Studies that did not directly address the comparison of conservative therapies and surgical interventions for carpal tunnel syndrome were removed.
2. **Full-Text Review:** Out of these studies, 15 were eligible for data analysis. Texts were thoroughly examined. Every study was evaluated in light of the predetermined inclusion and exclusion standards. Of these, six studies only were qualified for inclusion in the final analysis because they met all inclusion criteria and did not violate any exclusion criteria

Throughout the screening process, studies were excluded for various reasons:

1. Studies that did not directly address the comparison of conservative therapies and surgical interventions for carpal tunnel syndrome were excluded (n=3).
2. Studies that did not employ a randomized controlled trial (RCT) design or did not directly compare treatment modalities were excluded (n=3).
3. Studies conducted in specialized settings or not relevant to primary care (n=1)
4. Studies not available in English were excluded (n=2).

Results

Presentation of the synthesized findings

Six RCTs were included in the analysis, all looking at the efficacy of different approaches to treating CTS.

Conservative Therapies

- **Wrist splinting** Studies demonstrated that wrist splinting led to modest improvements in symptoms, with participants reporting reduced pain and tingling sensations
- **Physical Therapy:** Physical therapy interventions were associated with

enhanced hand and wrist mobility, although the degree of symptom relief varied among the studies

- **NSAIDs:** Limited evidence suggested that non-steroidal anti-inflammatory drugs (NSAIDs) contributed to pain reduction and inflammation control, albeit with mixed results.

Surgical Interventions

- Results from studies on carpal tunnel release surgery consistently showed fast symptom relief, considerable improvement in hand function, and a shorter recovery time.

25	**Symptom duration** Gp A: 12.5 +/- 8.76 mo; Gp B: 10.15 +/- 6.75 mo	N=40 patients **Sex:** 29F/11M **Age** Gp A: 43.8 10.98 yrs Gp B: 46.9 12.33 yrs	OCTR (20 patients) Steroid injection (20 patients)	Intervention favors surgical treatment to medical treatment after 3 and 6 months
27	**Symptom duration** Gp A: 3.2 (1.3 –5.5) yrs; Gp B: 3.4 (1.0 –8.7) yrs	**N** = 116 patients **Sex**: Gp A: 28F/29M Gp B: 34F/25M **Age** Gp A: 50.2 +/-10.3 yrs; Gp B: 51.2 +/- 8.9 yrs	Gp A: OCTR or ECTR (57 patients) Gp B: Multimodality ibuprofen, 6 sessions hand therapy over 6 wks, educational booklet, hand exercises, splinting night and day, work modifications (59 patients)	Intervention favors conservative treatment at 3 months but surgical at 6 months
33	**Symptom duration** Gp A: 31.12 +/-7.27 wks; Gp B: 33.25 +/- 8.17 wks	**N** =163 wrists/101 patients **Sex**: 93F/8M **Age** Gp A: 50.53 +/- 10.87 yrs; Gp B: 53.17 +/- 13.93 yrs	A: OCTR (80 wrists) B: 1 or 2 doses steroid injection (83 wrists)	Intervention favors surgical treatment to medical treatment after 3, 6 and 12 months

22	**Symptom duration:** Gp A: 21 +/- 11 mo; Gp B: 15.26 +/- 7.19 mo Gp C: 19.13 +/- 13 mo	**N** =57 wrists **Sex**: 53F/4M **Age**: GpA: 45.27 +/- 13.19 yrs; Gp B: 44.50 +/- 7.24 yrs; Gp C: 44.46+/- 8.52 yrs	GP A: OCTR (11 patient) GP B: Splinting (23 patients) Gp C: Splinting & 1 dose steroid injection (23 patient)	Improvement in all groups. Intervention did not favor any group than other
26	**Symptom duration** [Gp A: 40 (16 –104) wks; Gp B: 52 (24 –104) wks	**N** =50 patients **Sex** =48F/2M Gp A: 24F/1M, Gp B: 24F/1M **Age** Gp A: 50.8 +/-11.6 yrs; Gp B: 48.2 +/- 6.5 yrs	Gp A: OCTR (25 patients) Gp B: 1 dose steroid injection (25 patients)	intervention favors surgical treatment to medical treatment after 3 and 6 months
20	**Symptom duration** Gp A: 31.12 +/- 7.2 wks; Gp B: 33.25+/- 8.17 wks	**N**=163 wrists/101 patients **Sex**: 93F/8M **Age** Gp A: 50.53+/-10.87 yrs; Gp B: 53.17 +/-13.93 yrs	Gp A: OCTR (80 wrists) Gp B: 1 or 2 doses steroid injection (83 wrist)	intervention favors surgical treatment to medical treatment after 3 and 6 months

Discussion

Interpretation

Carpal tunnel syndrome (CTS) is a challenging condition to treat, as shown by the interpretation of the findings of the systematic literature review. As the results show, there is a wide range of success regarding symptom alleviation, functional improvement, and patient satisfaction between conservative therapy and surgical approaches for people with CTS.

Outcome and comparison with existing literature

The systematic review compares surgical and conservative treatments for carpal tunnel syndrome (CTS). The findings align with previous reviews, consistently favoring surgical treatment in terms of outcomes [4][12]. Although conservative treatment led to fewer complications, surgery showed superior results in improving symptoms and general function. [5] [6] [7] [8]

The review also found some agreement with the latest research, particularly in terms of statistically significant improvements in symptoms[9]. The qualitative analysis expanded the number of studies that could be included, allowing for more comprehensive results. Furthermore, it classified studies based on their quality, giving higher-quality studies a greater influence on overall results. This analysis considered the findings from each study, the quality of the methodology, and the number of studies that favored each intervention for various outcomes.

Surgery clearly outperformed conservative treatment in terms of symptom relief after six months[5][6]. At this point, the functional improvement was larger in the surgical group. The qualitative analysis, however, found conflicting findings and indicated a trend toward surgery without statistical significance (10) for symptoms and function at three months. This discrepancy was attributed to the use of steroid injections in conservative treatment, which provided short-term relief but didn't address the underlying mechanical compression causing symptoms[10].

Patients were assessed at 3 months, 6 months and some at 1 year and the results supported surgery. Conversely, conservative treatment with injections seemed more beneficial in the short term than surgery [11].

Complications and side effects were more common with surgery, with severe complications occurring exclusively in the surgical group[13]. Most reported side effects were related to postoperative pain or tenderness and unwillingness to move hand following the procedure However, the variation in reported side effects and the severity of complications made it challenging to determine the true advantage of conservative versus surgical treatment in this regard (14). Additionally, the heterogeneity in symptom severity, re-evaluation periods, and outcome measures across studies limited the ability to analyze subgroups based on these factors, which should be considered in future trials.

The review mainly focused on mild to moderate CTS cases and acknowledged limitations in the search strategy that may have affected the results neurophysiological tests for the diagnosis of CTS are debatable [15]. While some studies advocate using them as an extra diagnostic tool, some claim they may produce erroneous results. [16]. According to some research, since surgery was more effective in severe cases, the overall effectiveness of surgery might be higher than that of conservative treatment.[17] [18]

Implications and contributions

Clinical decision-making and patient care are not the only areas that this systematic literature review considered. Clinicians in primary care settings may now use evidence-based insights to make treatment decisions tailored to each patient. People who choose less intrusive approaches may be given recommendations for conservative therapy, while those who need immediate symptom alleviation may be given higher priority for surgical operations.

The study also highlights the need to tailor therapy to each patient based on their unique set of symptoms, treatment goals, and preferences. The results help healthcare practitioners and patients have more enlightened conversations, facilitating collaborative decision-making tailored to each person's unique needs and preferences

Conclusion

The findings of this review show that surgery demonstrate immediate and considerable symptom alleviation and neurophysiological markers more than conservative treatment. Usually, in mild symptoms, conservative therapy was shown to be successful. For extreme situations, surgical interventions were advised and produced successful results. The choice of treatment requires careful deliberation, considering the potential complications associated with surgical treatment and the fact that CTS may resolve spontaneously in some circumstances. The conclusions drawn from this review, nonetheless, are supported by a few unpowered research and as a result, high-quality prospective studies are required to determine the features of individuals for whom CTS offers a promising option to prevent unnecessary surgery. Furthermore, more study should be conducted to investigate the field of manual therapy and compare it to surgical intervention for CTS.

References

1. Wessel, L. E., Marshall, D. C., Stepan, J. G. H., Sacks, H. A., Nwawka, O. K., Miller, T. T., & Fufa, D. T. (2019). Sonographic Findings Associated With Carpal Tunnel Syndrome. *Journal of Hand Surgery*, *44*(5), 374–381. doi:10.1016/j.jhsa.2018.07.015.
2. Shiri R: Hypothyroidism and carpal tunnel syndrome: a meta-analysis. Muscle Nerve 2014; 50: pp. 879-883.
3. Birkbeck, M. Q., & Beer, T. C. (1975). Occupation in relation to the carpal tunnel syndrome. *Rheumatology*, *14*(4), 218–221. doi:10.1093/RHEUMATOLOGY/14.4.218
4. Shin, Y. H., Yoon, J. O., Kim, Y. K., & Kim, J. K. (2018). Psychological Status Is Associated With Symptom Severity in Patients With Carpal Tunnel Syndrome. *Journal of Hand Surgery*, *43*(5), 484.e1-484.e8. doi:10.1016/j.jhsa.2017.10.031
5. Verdugo RJ, Salinas RA, Castillo JL, Cea JG: Surgical versus non-surgical treatment for carpal tunnel syndrome. Cochrane Database Syst Rev 2008; 4: CD001552.
6. Ly-Pen D, Andreu JL, de Blas G, Sanchez-Olaso A, Millan I: Surgical decompression versus local steroid injection in carpal tunnel syndrome: a one-year, prospective, randomized, open, controlled clinical trial. Arthritis Rheum 2005; 52: pp. 612-619.
7. Ullah I. Local steroid injection or carpal tunnel release for carpal tunnel syndrome — which is more e®ective? J Postgrad Med Instit (Peshawar– Pakistan), North America, 27, Mar. 2013. 26.
8. Gerritsen AA, de Vet HC, Scholten RJ, Bertelsmann FW, de Krom MC, Bouter LM. Splinting vs surgery in the treatment of carpal tunnel syndrome: A randomized controlled trial. Jama 2002;288(10):1245–51
9. Ly-Pen D, Andreu JL, Millan I, de Blas G, Sanchez-Olaso A. Comparison of surgical decompression and local steroid injection in the treatment E®ectiveness of surgical treatment versus conservative treatment in CTS 113 of carpal tunnel syndrome: 2-year clinical results from a randomized trial. Rheumatology 2012;51(8): 1447–54
10. Kostopoulos D. Treatment of carpal tunnel syndrome: A review of the non-surgical approaches with emphasis in neural mobilization. J Bodyw Mov Ther 2004;8(1):2–8
11. Ucan H, Yagci I, Yilmaz L, Yagmurlu F, Keskin D, Bodur H.. Comparison of splinting, splinting plus local steroid injection and open carpal tunnel release outcomes in idiopathic carpal tunnel syndrome. *Rheumatol Int* 2006;27(1):45–51.
12. Jarvik JG, Comstock BA, Kliot M, et al. Surgery versus non-surgical therapy for carpal tunnel syndrome: A randomised

parallel-group trial. *Lancet* 2009;374(9695):1074–81.
13. Shi Q, MacDermid JC.. Is surgical intervention more effective than non-surgical treatment for carpal tunnel syndrome? A systematic review. *J Orthop Surg Res* 2011;6:17
14. Agee JM, McCarroll HR, North ER. Endoscopic carpal tunnel release using the single proximal incision technique. *Hand Clinics* 1994;10(4):647-59.
15. Kaplan SJ, Glickel SZ, Eaton RG.. Predictive factors in the non-surgical treatment of carpal tunnel syndrome. *J Hand Surg* 1990;15(1):106–8.
16. Finsen V, Russwurm H.. Neurophysiology not required before surgery for typical carpal tunnel syndrome. *J Hand Surg* 2001;26(1):61–4.
17. Osiak K, Mazurek A, Pękala P, Koziej M, Walocha JA, Pasternak A. Electrodiagnostic Studies in the Surgical Treatment of Carpal Tunnel Syndrome-A Systematic Review. J Clin Med. 2021 Jun 18;10(12):2691. doi: 10.3390/jcm10122691. PMID: 34207345; PMCID: PMC8235020.
18. Fernandez-de-Las Penas C, Ortega-Santiago R, de la Llave-Rincon AI, et al. Manual physical therapy versus surgery for carpal tunnel syndrome: a randomized parallel-group trial. *J Pain*. 2015;16(11):1087-1094. doi: 10.1016/j.jpain.2015.07.012.
19. Hernández-Secorún M, Montaña-Cortés R, Hidalgo-García C, Rodríguez-Sanz J, Corral-de-Toro J, Monti-Ballano S, Hamam-Alcober S, Tricás-Moreno JM, Lucha-López MO. Effectiveness of Conservative Treatment According to Severity and Systemic Disease in Carpal Tunnel Syndrome: A Systematic Review. Int J Environ Res Public Health. 2021 Feb 28;18(5):2365. doi: 10.3390/ijerph18052365. PMID: 33671060; PMCID: PMC7957741.