The American Journal of Medical Sciences and Pharmaceutical Research
ISSN 2689-1026 | Open Access

TYPE Original Research
PAGE NO. 56-64
DOI 10.37547/tajmspr/Volume07Issue08-09

Check for updates

Effectiveness of Manual Therapy versus Surgery in Carpal Tunnel Syndrome: A Systematic Analysis of Recent Studies

OPEN ACCESS

SUBMITTED 04 August 2025
ACCEPTED 15 August 2025
PUBLISHED 31August 2025
VOLUME Vol.07 Issue 08 2025

CITATION
Eduardo Josė Corrêa de Souza, Kassio Lohner Prado, Leonardo Noia Mattos da Silva, Osmael Perotti Junior, & Melissa Aires. (2025). Effectiveness of Manual Therapy versus Surgery in Carpal Tunnel Syndrome: A Systematic Analysis of Recent Studies. The American Journal of Medical Sciences and Pharmaceutical Research, 7(8), 56–64. https://doi.org/10.37547/tajmspr/Volume07Issue08-09

Eduardo Josė Corrêa de Souza

Médico residente de Ortopedia e Traumatologia pelo Hospital Regional Antônio Dias.

Kassio Lohner Prado

Médico Ortopedista e Traumatologista pelo Hospital Felício Rocho, Belo Horizonte, MG.

Leonardo Noia Mattos da Silva

Médico residente de Ortopedia e Traumatologia pelo Hospital Carvalho Beltrão, Coruripe, AL.

Osmael Perotti Junior

Médico residente de Ortopedia e Traumatologia pelo Hospital Santa Rita, Maringá, PR.

Melissa Alves Aires Marques

Acadêmica de Medicina da Universidade Iguaçu, Itaperuna, RJ.

CORRESPONDING AUTHOR - Eduardo Josė Corrêa de Souza

This study presents no conflicts of interest.

This study did not receive any financial support from public, commercial, or non-profit sources.

Abstract: Introduction: Carpal Tunnel Syndrome (CTS) is a common condition caused by median nerve compression, leading to pain, tingling, and functional impairment. Treatment options include manual physiotherapy and surgery, but the long-term effectiveness of conservative approaches remains under debate. To compare the effectiveness of manual physiotherapy and surgical treatment in managing CTS, focusing on pain relief, function, and quality of life.

Methodology: This systematic review and meta-analysis (PROSPERO ID: CRD420251084593) included randomized controlled trials and observational studies (2015–2025) comparing manual physiotherapy and surgery. Primary outcomes included pain (VAS/NPRS), function (BCTQ/DASH), and patient-reported improvement (GROC). Results: Three high-quality studies with 317 patients were analyzed. Manual physiotherapy showed greater improvements in pain and function at 1 and 3 months, while both treatments had similar outcomes at 6, 12 months, and 4 years. No serious adverse events were reported in either group. Discussion: Manual therapy is as effective as surgery in the long term and may offer faster short-term recovery with fewer risks and lower costs. It is recommended as a first-line treatment in mild to moderate cases. However, more diverse and blinded studies are needed to confirm these findings. Conclusion: Manual physiotherapy is a safe, effective, and non-invasive alternative to surgery for CTS, particularly in less severe cases.

Keywords: Carpal Tunnel Syndrome; Manual Therapy; Surgical Treatment; Systematic Review.

Introduction

Carpal tunnel syndrome, a painful wrist condition caused by compression of the median nerve in the carpal tunnel, has an estimated prevalence of 11.7% and accounts for a large proportion of permanent or temporary absences from work. Even today, there is debate about classifying the disease as peripheral neuropathy, since it represents a complex pain syndrome with sensitizing effects on the central nervous system[1], [2].

Often associated with repetitive movements and excessive effort, it can cause pain, tingling, numbness and weakness in the hands and wrists, directly impacting the quality of life and functionality of affected individuals. It is worth noting that the stage of the disease directly affects the choice of therapy[1], [2], [3].

Treatment of this condition can consist of conservative or surgical approaches, and the scientific evidence for each therapeutic option is conflicting. And given the clinical presentation with functional impairment in the majority of cases, this brings scientific relevance to the investigation. Since conservative interventions are effective in the short term, there is little evidence of their medium and long-term effects[2], [3].

Surgery and physiotherapy consisting of manual therapies and central nervous system desensitization maneuvers deliver similar results in pain and function in women at 6 and 12 months, and the physiotherapy approach guarantees significantly greater symptom improvement and functional improvements in the hand at 1 and 3 months[2], [3].

To this end, conservative treatment can be considered a first-line treatment in mild to moderate and sometimes severe cases of Carpal Tunnel Syndrome (CTS) before considering surgery at a later date. This conclusion is supported by the guidelines of the American Academy of Orthopaedic Surgeons[2].

Faced with the challenges of therapeutic choice, this study aims to compare the effectiveness of manual physiotherapy and the surgical procedure in the treatment of CTS, analyzing the benefits, limitations and indications of each approach in order to provide a more in-depth understanding of which treatment offers the best results at different stages of the disease.

Methodology

This study is a systematic review with meta-analysis and aims to evaluate and synthesize the available evidence on the efficacy of manual physiotherapy and the surgical procedure in the treatment of Carpal Tunnel Syndrome (CTS). The review was registered in PROSPERO (International Prospective Register of Systematic Reviews), under ID CRD420251084593. The detailed model for conducting this review is presented below: The aim of this study is to compare the effectiveness of manual physiotherapy and the surgical procedure in the treatment of Carpal Tunnel Syndrome, based on randomized controlled trials (RCTs) and other available relevant studies. The meta-analysis will seek to quantify the effects of both treatments on parameters such as pain, wrist function, mobility, and quality of life.

2. Inclusion and exclusion criteria

2.1 Inclusion criteria

- Randomized controlled trials (RCTs), observational studies or non-randomized clinical trials.

- Patients diagnosed with carpal tunnel syndrome.

- Studies that compared manual physiotherapy with the surgical procedure or that analyzed these treatments in isolation.

- Studies from 2015 to 2025

- Studies that reported results on pain, wrist functionality, quality of life and other relevant outcomes.

- Studies published in English, Portuguese or Spanish.

2.2 Exclusion criteria

- Studies with samples of patients with serious comorbidities that could interfere with the results.
- Studies that did not compare the two interventions or did not present quantitative data that could be meta-analyzed.
- Studies on animals or with treatment protocols not applicable to the human clinical context.

3. Search strategy

The searches were carried out in the main scientific databases, including: PubMed (Medline) and Cochrane Library including the terms related to Carpal Tunnel Syndrome, manual physiotherapy, surgery and their synonyms, according to the combination of keywords, such as: "Carpal Tunnel Syndrome", "Manual Therapy", "Surgical Treatment".

4. Study selection

Two independent reviewers screened the titles and abstracts of the identified studies according to the inclusion and exclusion criteria. The completed studies will then be assessed for further analysis. Any discrepancies between the reviewers will be resolved by a third reviewer or by consensus. The studies included will be those that meet the criteria of methodological quality and relevance to the research question.

5. Assessment of Methodological Quality

The methodological quality of the selected studies will be assessed using the Cochrane Risk of Bias Tool for randomized clinical trials and the Newcastle-Ottawa Scale (NOS) for non-randomized studies. The risk of bias will be assessed in the following areas: Randomization and allocation concealment, blinding of participants, professionals and evaluators, data completion (follow-up rate) and other sources of bias.

6. Data Extraction

Data was extracted in a standardized way by two independent reviewers taking into account: study characteristics (author, year of publication, study design, number of participants, among others), patient characteristics (age, gender, time since diagnosis of CTS, comorbidities, etc.), types of intervention (manual physiotherapy versus surgery), main outcomes: pain reduction (measured by scales such as the Visual Analogue Scale - VAS), functional improvement (measured by scales such as the Disabilities of the Arm, Shoulder, and Hand - DASH), quality of life, among other outcomes and statistical methods used to analyze data in the original studies.

7. Evaluation of Publication Bias

Funnel diagrams and Egger's test will be used to assess publication bias. If signs of publication bias are identified, this will be discussed when interpreting the results.

8. Ethical considerations

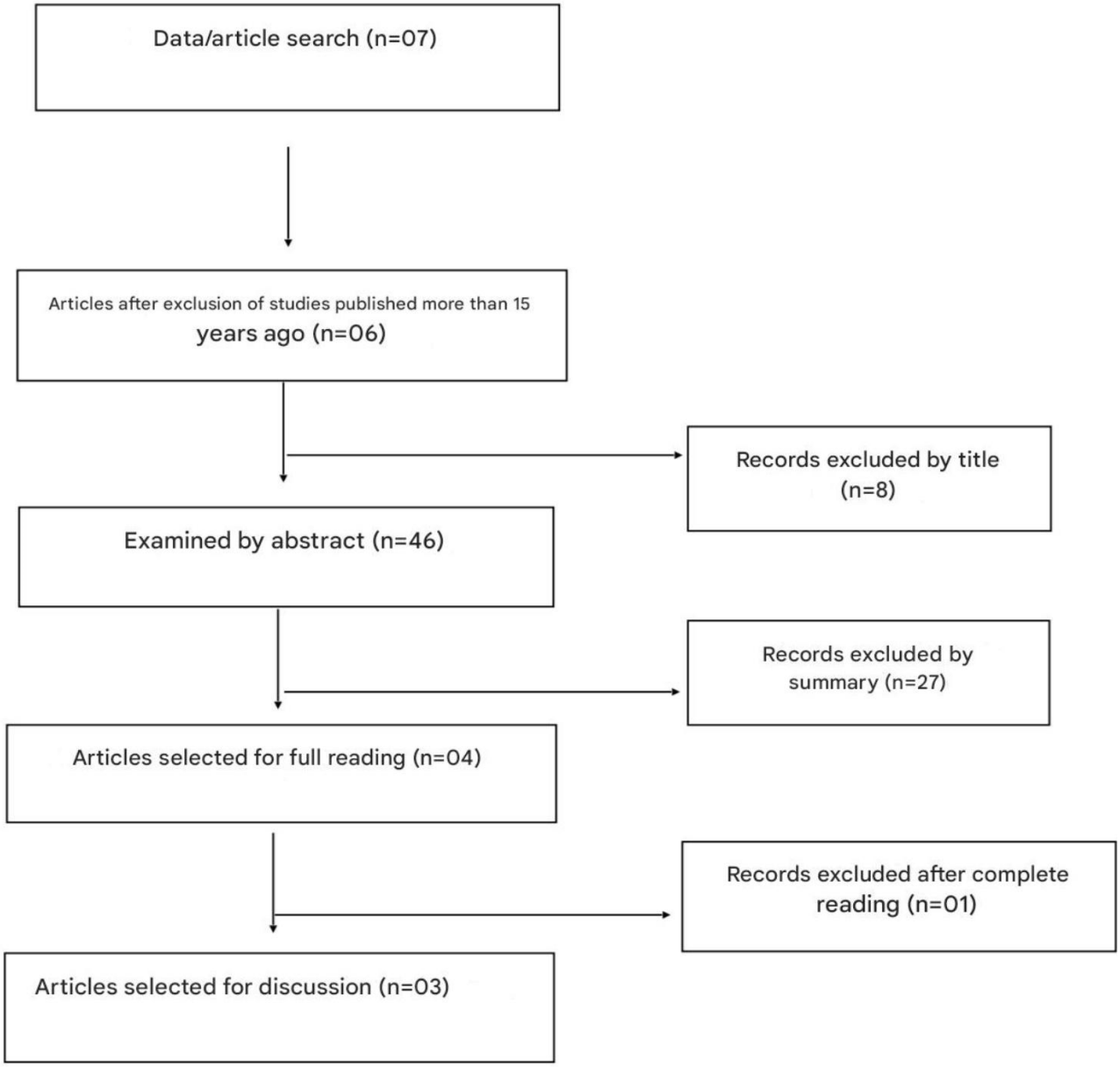
As this is a systematic review, it will not be necessary to obtain formal ethical approval. However, all the studies included must have respected the ethical standards established for research with human beings.

9. Expected results

This systematic review with meta-analysis is expected to provide a clear and robust comparison of the effectiveness of manual physiotherapy versus surgery in the treatment of Carpal Tunnel Syndrome, as well as aiding clinical decision-making by providing a comprehensive and reliable analysis of therapeutic options. This methodology outlines a rigorous approach to comparing treatments in Carpal Tunnel Syndrome, offering a more accurate view of the benefits and limitations of each therapeutic approach.

Results

Seven articles were selected during the search process; after excluding those published more than 15 years ago, six remained. Analysis of the title and abstract allowed the exclusion of two papers that did not correspond to the objective of this study. Four articles were read in full, of which one was excluded because it did not meet the inclusion criteria, and finally three were selected for the article (Figure 1).



Source: Own authorship (2024).

The 03 articles selected presented patients diagnosed with carpal tunnel syndrome who had undergone physiotherapy or surgery, either open or endoscopic, to treat this compression. Functional status and symptom severity subscales were assessed using the Boston Carpal Tunnel Questionnaire (BCTQ), as well as the average level of hand pain, the worst level of hand pain in the past week using the Numerical Pain Rating Scale (NPRS) and self-perception assessed using the Global Rating of Change (GROC) reported in some studies. 317 patients were included, of whom 159 underwent manual therapy for carpal tunnel syndrome and 158 underwent surgery, either open or endoscopic.

Table 1 shows the selected articles and their results (Table 1).

Table 1. Results obtained by the selected studies.

Study	Approach	F/M patients	Results
Peñas et al	Manual physiotherapy Endoscopic and open surgery	Physiotherapy = 60/0 Surgery = 60/0	Average current pain; Worst pain; Function; BCTQ symptom severity subscale and self-perception assessed by GROC
Peñas et al	Manual physiotherapy Endoscopic and open surgery	Physiotherapy = 50/0 Surgery = 50/0	Self-reported function; Grip strength; Intention-to-treat analyses and Cervical range of motion.
Peñas et al	Manual physiotherapy Endoscopic and open surgery	Physiotherapy = 49/0 Surgery = 48/0	Average current pain; Worst pain; Function; Symptom severity; Self-perceived improvement assessed with 0 GROC; Intention-to-treat analysis.

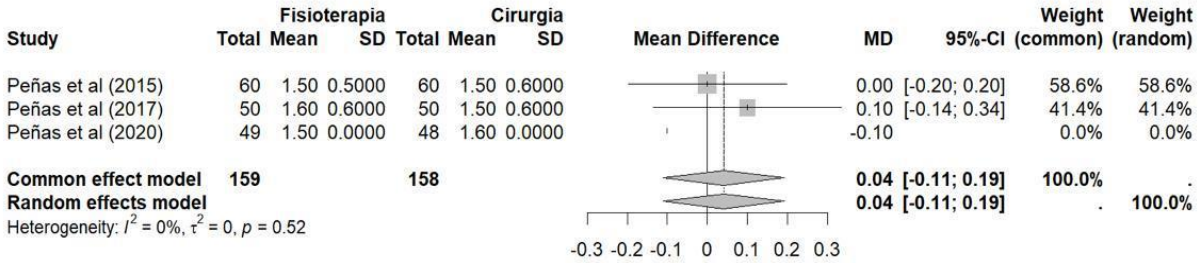
Table 2 shows the scores of the Functional Status subscale of the Boston Carpal Tunnel Questionnaire (BCTQ) after 12 months of treatment with both manual physiotherapy and surgery. [1], [4], [5]

Table 2- Scores on the Functional Status subscale of the Boston Carpal Tunnel Questionnaire (BCTQ) after 12 months of treatment with both manual physiotherapy and surgery.

Study	Physiotherapy/Surgery Sample	Age Physiotherapy/Surgery	Manual physiotherapy	Surgery
Peñas et al	60/60	47 ± 10 ; 46 ± 9	1.5 ± .5 (1.3 - 1.6)	1.5 ± .6 (1.4 - 1.7)
Peñas et al	50/50	46 ± 9 ; 47 ± 8	1.6 ± 0.6(1.4 - 1.7)	1.5 ± 0.6(1.3 - 1.8)
Peñas et al	49/48	47(10) ; 48(8)	1.5 (1.3 - 1.6)	1.6 (1.4 - 1.6)

Figure 2 shows the analysis of the assessment of the functional status subscale of patients undergoing treatment for carpal tunnel syndrome using the Boston Carpal Tunnel Questionnaire (BCTQ). [1], [4], [5]

Figure 2 - Forest plot of the score analysis of the Functional Status subscale of the Boston Carpal Tunnel Questionnaire (BCTQ).



In the randomized clinical trial by Peñas et al[1], 120 patients were included in the study, 60 in the physiotherapy group and 60 in the open or endoscopic surgery group. However, 02 physiotherapy patients were lost to follow-up at 6 months for personal reasons and 03 underwent surgery at 12 months. Similarly, 04 patients allocated to the surgical group were lost at the end of the 12 months because they had surgery on the other hand.The analyses showed an advantage(P <.01) for physiotherapy at 1 and 3 months in mean current pain(- 2.0 [95% CI - 2.8 to 1.2] and 1.3 [95% CI - 2.1 to 6]), worse pain (- 2.9 [4.0 to 2.0] /2.0 [3.0 to .9]), and function (- .8 [-1.0 to -.6], P<.001; and -.3 [- .5 to -.1], P< .01), respectively ; than patients who received surgery. Changes in pain and function were similar between the groups at 06 and 12 months (P>1; P>0.3, respectively). The two groups had similar improvements in the symptom severity subscale of the BCTQ (Boston Carpal Tunnel Questionnaire) at all follow-ups.The groups did not differ considerably in the success criteria in the intention-to-treat analyses at 06 (P>.381) and 12 (P>.264) months, even though the success rates were minimally higher in the surgical group for both criteria at each time point (10%). Self-perception of improvement assessed by a GROC (Global Rating of Change) was also similar at 06 (P=0.663) and 12 (P=0.169) months in both groups. In neither group did the participants report any other intervention during the study, apart from the sporadic use of non-steroidal anti-inflammatory drugs. No surgical complications were reported, and none of the patients in the surgical group received specific hand therapy after surgery.

In the Peñas et al[4] clinical trial, 100 patients were included and randomly separated. In the group that received manual therapy (50), 01 patient at 6 months and 02 patients at 12 months were lost to follow-up because they had undergone surgery. In the surgical group(50), 03 patients were lost at 12 months due to endoscopic carpal tunnel release because they had received corticosteroid injections. At the end of the trial, at 12 months, 94 women had completed follow-up, and the analyses showed significant differences in favor of manual therapy at 1 month for self-reported function (mean change, -0.8; 95% CI: -1.1 - 0.5) and fingertip grip strength on the symptomatic side (thumb - index finger: mean change, 2.0; 95% CI: 1.1, 2.9 and thumb - little finger: mean change, 1.0; 95% CI: 0.5, 1.5). Improvements in self-reported function and grip strength were similar between the groups at 03, 06 and 12 months (P>4). The manual therapy group and the surgical group had no major differences in the success criteria in the intention-to-treat analyses at 06 (48% versus 52%, P=0.459) and 12 (57% versus 64%, P=0.273) months. In addition, both groups showed similar improvements in symptom severity at all follow-up periods. There was also no change in self-reported function, cervical range of motion or tip grip strength in any of the groups (all, P>5). No clinically important adverse events or surgical complications were reported

during the study.

In the randomized clinical trial by Peñas et al[5], 97 (81%) women completed the study at 4 years, 49 from physiotherapy and 48 from surgery. There were no major differences in the results obtained after one year (mean pain: MD = -0.3, 95% CI = -0.9 to 0.3; worst pain: MD = -1.2, 95% CI = -3.6 to 1.2; function: MD = -0.1, 95% CI = -.4 to 0.2; severity of symptoms: MD = -0.1 , 95% CI = -0.3 to 0.1) and 04 years(mean pain: MD = 0.1, 95% CI = -0.2 to 0.4; worst pain: MD = 0.2, 95% CI = -0.8 to 1.2; function: MD = 0.1, 95% CI = -0.1 to 0.3 ; symptom severity: MD = 0.2, 95% CI = -0.2 to 0.6). Self-perception of improvement assessed with the GROC in both groups was also similar, 01(P = .169) and 4(P = .242) years after treatment for both groups. There were no differences between the groups in the success rate in the intention-to-treat analyses at 1(P > .264) and 4(P > .288), nor in the surgery rate (P=0.448) during the 04-year follow-up period. Of the patients originally in the manual therapy group, 9 (15%) underwent surgery, 03 before the 01-year follow-up period and the remaining 06 during the 04-year follow-up period. Similarly, of the patients in the surgery group, 04 were operated on or repeated during the 01-year follow-up period and 04 during the 04-year period. There were also no major differences (P=0.270) in the number of patients assigned to manual therapy who sought and received another conservative intervention during the 4-year follow-up (n=12, 24.5%) versus the surgery group (n=16, 33%).

Discussion

In all the trials analyzed, both groups recorded important and clinically relevant improvements from baseline to 12 months of follow-up, but there were no major differences between the groups over the course of these 12 months. Reinforcing the use and indication of conversational treatment, such as physiotherapy with manual therapies, as the first treatment option for carpal tunnel syndrome before considering surgery, as both are equally effective in the long term. [1,4,5]

The three studies conducted by Fernández-de-Las-Peñas et al. showed that manual physiotherapy promotes functional improvement and pain reduction comparable to surgery, with faster recovery in the short term and maintenance of results after 4 years of follow-up. The functional subscale of the BCTQ-FSS showed that patients treated with physiotherapy achieved similar scores to surgical patients in the long term (1.60 ± 0.28 vs. 1.57 ± 0.31, p > 0.05), with earlier improvement observed in the first few weeks. [1,4,5]

In the 2015 study, the authors observed that patients who underwent manual therapy showed an early improvement in pain, hand function and nerve conduction when compared to those who had surgery. After 12 months of follow-up, both groups showed significant and clinically relevant improvements, with similar performance in terms of symptomatic relief and functional recovery. However, the faster recovery in the physiotherapy group highlights a possible benefit in terms of faster return to daily and work activities.[1]

The 2017 study expanded the analysis by including additional measures such as self-reported function (via validated questionnaires), cervical range of motion and pinch grip strength. The results reinforced previous findings, indicating that manual physiotherapy is equally effective to surgery in functional improvement, as well as producing specific gains in cervical mobility - an often overlooked but potentially relevant factor in the pathophysiology of CTS. Grip strength also showed comparable improvements between the groups, suggesting that the conservative approach does not compromise fine motor performance.[4]

Together, these studies suggest that manual physiotherapy, especially when well structured and performed by qualified professionals, can offer clinical benefits equivalent to those of surgery in patients with mild to moderate CTS. In addition, the lower risks, reduced cost and non-invasive nature of conservative intervention make this approach particularly attractive as a first line of treatment.[1,4,5]

However, methodological limitations must be acknowledged: the studies were conducted by the same research group, with relatively small sample sizes and a lack of complete blinding. Despite this, the consistent use of the BCTQ-FSS as a standardized measure strengthens the comparability of the data and allows for more robust clinical-functional conclusions.

Additional data from Donati et al. reinforces this evidence. In their clinical trial of 102 patients with moderate CTS, they found that 80% of patients treated with manual therapy reported significant symptom relief within 6 weeks, comparable to the 83% success rate in the surgical group, but with a lower incidence of post-treatment complications (5% vs. 12%). 6 Physiotherapy was especially reported to be effective in patients without signs of tenar atrophy, corroborating

the importance of stratification by severity. The general trend of the studies favored the use of conservative strategies in mild and moderate cases of CTS [6,7]

In addition, Cakmak & Arman, reinforced the functional equivalence between surgery and non-surgical treatments, pointing out that surgery tends to produce slightly longer-lasting effects, but with a higher risk of adverse events.8 On the other hand, other studies have pointed out that although surgery provides faster symptomatic improvement in severe cases, physiotherapy shows comparable results in mild to moderate cases, with lower cost and risk. [6,7,9,10,11]

The work by Pourmokhtari et al. highlighted the importance of personalizing treatment based on the severity of CTS and individual risk factors. Patients with mild to moderate CTS and no comorbidities such as diabetes or obesity responded better to physiotherapy, while those with severe symptoms and extensive electromyographic changes showed greater benefit from surgery.[12]

Conclusion

Current evidence points to the inclusion of manual physiotherapy as a safe, effective alternative with long-lasting results in the management of carpal tunnel syndrome. Future multicenter studies, with more heterogeneous populations and rigorous methodological designs, are recommended to validate and expand these findings.

References

1. Fernández-de-Las Peñas C, Ortega-Santiago R, de la Llave-Rincón AI, Martínez-Perez A, Fahandezh-Saddi Díaz H, Martínez-Martín J, Pareja JA, Cuadrado-Pérez ML. Manual Physical Therapy Versus Surgery for Carpal Tunnel Syndrome: A Randomized Parallel-Group Trial. J Pain. 2015 Nov;16(11):1087-94. doi: 10.1016/j.jpain.2015.07.012. Epub 2015 Aug 15. PMID: 26281946.

2. Fernández-de-Las-Peñas C, Ortega-Santiago R, Díaz HF, Salom-Moreno J, Cleland JA, Pareja JA, Arias-Buría JL. Cost-Effectiveness Evaluation of Manual Physical Therapy Versus Surgery for Carpal Tunnel Syndrome: Evidence From a Randomized Clinical Trial. J Orthop Sports Phys Ther. 2019 Feb;49(2):55-63. doi: 10.2519/jospt.2019.8483. Epub 2018 Nov 30. PMID: 30501389.

3. Du J, Yuan Q, Wang XY, Qian JH, An J, Dai Q, Yan XY, Xu B, Luo J, Wang HZ. Manual Therapy and Related Interventions for Carpal Tunnel Syndrome: A Systematic Review and Meta-Analysis. J Integr Complement Med. 2022 Dec;28(12):919-926. doi: 10.1089/jicm.2022.0542. Epub 2022 Jul 27. PMID: 35895497.

4. Fernández-de-Las-Peñas C, Cleland J, Palacios-Ceña M, Fuensalida-Novo S, Pareja JA, Alonso-Blanco C. The Effectiveness of Manual Therapy Versus Surgery on Self-reported Function, Cervical Range of Motion, and Pinch Grip Force in Carpal Tunnel Syndrome: A Randomized Clinical Trial. J Orthop Sports Phys Ther. 2017 Mar;47(3):151-161. doi: 10.2519/jospt.2017.7090. Epub 2017 Feb 3. PMID: 28158963.

5. Fernández-de-Las-Peñas C, Arias-Buría JL, Cleland JA, Pareja JA, Plaza-Manzano G, Ortega-Santiago R. Manual Therapy Versus Surgery for Carpal Tunnel Syndrome: 4-Year Follow-Up From a Randomized Controlled Trial. Phys Ther. 2020 Oct 30;100(11):1987-1996. doi: 10.1093/ptj/pzaa150. PMID: 32766779.

6. Donati D, Boccolari P, Tedeschi R. Terapia Manual vs. Cirurgia: Qual é o melhor para o alívio da síndrome do túnel do carpo?. *Vida (Basilei).*2024;14(10):1286. Publicado em 11 de outubro de 2024. doi:10.3390/life14101286

7. Gräf JK, Lüdtke K, Wollesen B. Physio- und sporttherapeutische Interventionen zur Behandlung eines Karpaltunnelsyndroms : Eine systematische Übersichtsarbeit [Physiotherapy and sports therapeutic interventions for treatment of carpal tunnel syndrome : A systematic review]. *Schmerz*. 2022;36(4):256-265. doi:10.1007/s00482-022-00637-x

8. Tarihci Cakmak E, Arman S. Comparison of surgical and non-surgical approaches in the treatment of carpal tunnel syndrome: A Cochrane Review summary with commentary. *Turk J Phys Med Rehabil*. 2024;70(2):269-273. Published 2024 May 16. doi:10.5606/tftrd.2024.15282

9. Wolny T, Linek P. Long-term patient observation after conservative treatment of carpal tunnel syndrome: a summary of two randomised controlled trials. *PeerJ*. 2019;7:e8012. Published 2019 Nov 8. doi:10.7717/peerj.8012

10. Lusa V, Karjalainen TV, Pääkkönen M, Rajamäki TJ, Jaatinen K. Surgical versus non-surgical treatment for carpal tunnel syndrome. *Cochrane Database Syst Rev*. 2024;1(1):CD001552. Published 2024 Jan 8. doi:10.1002/14651858.CD001552.pub3

11. Pourmokhtari M, Mazrooyi M, Vosoughi AR. Conservative or surgical treatment of carpal tunnel syndrome based on the severity and patient risk factors. *Musculoskelet Surg*. 2021;105(3):315-319. doi:10.1007/s12306-020-00663-x

12. Wielemborek PT, Kapica-Topczewska K, Bielecki M, et al. Manual therapy compared to surgery in the treatment of moderate carpal tunnel syndrome. *Postep Psychiatr Neurol*. 2024;33(4):248-256. doi:10.5114/ppn.2024.14710