

## **Effectiveness of manual therapies versus surgical decompression in hand function in women with carpal tunnel syndrome: a systematic review**

**Eficácia das terapias manuais versus descompressão cirúrgica na função da mão em mulheres com síndrome do túnel do carpo: uma revisão sistemática**

**Eficacia de las terapias manuales versus descompresión quirúrgica en la función de la mano en mujeres con síndrome del túnel carpiano: una revisión sistemática**

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**Adriana Pontes Carvalho**

ORCID: <https://orcid.org/0000-0002-9525-1202>  
Universidade Federal de Pernambuco, Brasil  
E-mail: [reabilitacaomao@gmail.com](mailto:reabilitacaomao@gmail.com)

**Helen Kerlen Bastos Fuzari**

ORCID: <https://orcid.org/0000-0001-8563-929X>  
Universidade Federal de Pernambuco, Brasil  
E-mail: [helen.fisio@uol.com.br](mailto:helen.fisio@uol.com.br)

**Manuella Moraes Monteiro Barbosa Barros**

ORCID: <https://orcid.org/0000-0003-4245-7335>  
Universidade Federal de Pernambuco, Brasil  
E-mail: [manu\\_mmbb@hotmail.com](mailto:manu_mmbb@hotmail.com)

**Fernando Henrique Moraes de Souza**

ORCID: <https://orcid.org/0000-0003-1508-7551>  
Hospital da Restauração de Pernambuco, Brasil  
E-mail: [fhneuro@gmail.com](mailto:fhneuro@gmail.com)

**Silvia Nery Bernardino**

ORCID: <https://orcid.org/0000-0002-3054-5576>  
Hospital Getúlio Vargas de Pernambuco, Brasil  
E-mail: [s-nery@hotmail.com](mailto:s-nery@hotmail.com)

**Daniella Araújo de Oliveira**

ORCID: <https://orcid.org/0000-0002-6013-978X>  
Universidade Federal de Pernambuco, Brasil  
E-mail: [sabinodanielllaufpe@gmail.com](mailto:sabinodanielllaufpe@gmail.com)

### **Abstract**

**Purpose:** To assess the quality of evidence for the efficacy of manual therapy in improving hand function in relation to surgical decompression in women with CTS. **Methodology:** Seven electronic databases were searched to identify randomized controlled trials that compared the efficacy of exclusive manual therapies and surgical decompression in improving hand function in women with carpal tunnel syndrome. Quality assessment was conducted using the Cochrane risk of bias tool. The study was registered in PROSPERO under number CRD42018084250. **Results:** Two trials were identified and included in the review. The results of critical appraisal of quality was low risk of bias. **Conclusion:** Evidence suggest that manual therapy may have similarly effective in relation to surgery decompression in improving hand function in women with carpal tunnel syndrome. Future trials must assess the efficacy of manual therapies in different numbers of session looking for better results.

**Keywords:** Carpal tunnel Syndrome; Manual therapy; Manipulations; Hand function; Surgery decompression.

### **Resumo**

**Objetivo:** Avaliar a qualidade das evidências para a eficácia da terapia manual na melhora da função da mão em relação à descompressão cirúrgica em mulheres com STC. **Metodologia:** Sete bancos de dados eletrônicos foram pesquisados para identificar ensaios clínicos randomizados que compararam a eficácia de terapias manuais exclusivas e descompressão cirúrgica na melhora da função da mão em mulheres com síndrome do túnel do carpo. A avaliação da qualidade foi realizada usando a ferramenta Cochrane de risco de viés. O estudo foi registrado no PROSPERO sob o número CRD42018084250. **Resultados:** Dois estudos foram identificados e incluídos na revisão. O resultado da avaliação crítica da qualidade foi de baixo risco de viés. **Conclusão:** Evidências sugerem que a terapia manual pode ter eficácia semelhante em relação à descompressão cirúrgica na melhora da função da mão em mulheres com síndrome do túnel do carpo. Ensaios futuros devem avaliar a eficácia das terapias manuais em diferentes números de sessões em busca de melhores resultados.

**Palavras-chave:** Síndrome do túnel do carpo; Terapia manual; Manipulações; Função da mão; Cirurgia descompressiva.

### **Resumen**

**Propósito:** Evaluar la calidad de la evidencia sobre la eficacia de la terapia manual para mejorar la función de la mano en relación con la descompresión quirúrgica en mujeres con STC. **Metodología:** Se realizaron búsquedas en siete bases de datos electrónicas para identificar ensayos controlados aleatorios que compararan la eficacia de las terapias manuales exclusivas y la descompresión quirúrgica para mejorar la función de la mano en mujeres con síndrome del túnel carpiano. La evaluación de la calidad se realizó mediante la herramienta Cochrane de riesgo de sesgo. El estudio fue registrado en PROSPERO con el número CRD42018084250. **Resultados:** Se identificaron e incluyeron dos ensayos en la revisión. Los resultados de la evaluación crítica de la calidad fueron de bajo riesgo de sesgo. **Conclusión:** La evidencia sugiere que la terapia manual puede tener una eficacia similar en relación con la cirugía de descompresión para mejorar la función de la mano en mujeres con síndrome del túnel carpiano. Los ensayos futuros deben evaluar la eficacia de las terapias manuales en diferentes números de sesiones en busca de mejores resultados.

**Palabras clave:** Síndrome del túnel carpiano; Terapia manual; Manipulaciones; Función de la mano; Cirugía descompressiva.

## **1. Introduction**

Carpal tunnel syndrome (CTS) is considered the neuropathy with higher incidence of the upper limb, caused by increased pressure inside the carpal tunnel, leading to median nerve's compression (Hardoim et al., 2009; Kotwall & Varshney 2009; Ibrahim et al., 2012; Parish et al., 2020). Paresthesia, pain and tingling are the main symptoms (Kotwall & Varshney 2009; Ibrahim et al., 2012; Scalise et al., 2021), that restrict a variety of hand's function including daily living activities and work performance (Burke et al., 2003).

The clinical diagnosis of CTS is based on the clinical history with the report of signs and symptoms of the syndrome, confirmed by the finding of the electroneuromyography (ENMG) or nerve conduction studies, which detects changes in sensory conduction, motor latency and amplitudes (Werner & Andary 2002; Atroshi et al., 2003; Kouyoumdjian et al., 2003; Scalise et al., 2021).

CTS treatments options may be surgical or conservative treatment, among the non-surgical options, there is: use of orthoses, ultrasound (Michlovitz 2004), laser therapy (Bekhet et al., 2017), manipulations (Elliott and Burkett 2013; Maddali Bongi et al., 2013) and steroid injections (Michlovitz 2004). Surgical options include median nerve decompression techniques, which are open or closed, also known as endoscopic (Vasiliadis et al., 2015; Ohno et al., 2016).

In the most recent systematic review that examined the efficacy of a conservative treatment (splinting, steroid injection and laser therapy) versus surgical treatment, concluded that both interventions have benefits, however, surgical treatment presents a slight improvement in function and symptoms at 6 and 12 months compared to conservative treatment (Shi & MacDermid 2011).

Manual therapy, a form of conservative treatment based on the therapist's manual intervention with soft tissue manipulations, joint mobilization and neural gliding, has shown an improvement in CTS symptomatology through the mechanism of tissue release with adhesion and amplitude gain (Maddali Bongi et al., 2013; Parish et al., 2020).

Given what has been exposed, we aim to evaluate the manual therapy, conservative treatment in a more specific way, without the use of other technique associated. The objective of this review is to conduct a systematic review to verify the effectiveness of manual therapy in the improvement of hand function in relation to surgical decompression in women with CTS.

## **2. Methodology**

A systematic review of controlled and randomized clinical trials that compared manual therapies and surgical decompression in relation to hand function in women with CTS. To be eligible for inclusion, studies had to meet the following

conditions: 1) Participants should be women with a diagnosis of CTS and over 18 years old. 2) The studies had to be Randomized Controlled Trial that compared manual therapy and surgical decompression for carpal tunnel syndrome. 3) The outcome measure had to be symptom severity and functional status. Exclusion criteria: studies with diabetic patients, pregnant women, use of electrotherapy, orthosis and steroid injections.

The primary outcome was the state of the hand function, assessed using the Functional Status Scale (FSS) at the Boston Carpal Tunnel Questionnaire (BCTQ) and secondary outcome, the severity of symptoms assessed using the Severity of Symptom Scale (SSS) at the BCTQ

The review was planned and conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The study searches were conducted in the following electronic databases: MEDLINE (via PubMed), Latin American and Caribbean Health Sciences literature (LILACS) (via BIREME), Cochrane central register of Controlled Trial (CENTRAL), CINAHL, Scopus, Web of Science and Database of the Brazilian Institute of information in Science and Technology (IBITC). Initially relevant titles and abstracts found in the database search were selected, followed by further analysis of the full text was performed. There were no linguistic restriction or year of publication restriction to minimize possible publication bias. The descriptors used for the search followed the description of the Mesh terms, being: “carpal tunnel syndrome”, “musculoskeletal manipulation”, “massage”, “surgical decompression”, besides the key word: “manual therapy” and “osteopathic manipulation” using the boolean operator “AND” and “OR”.

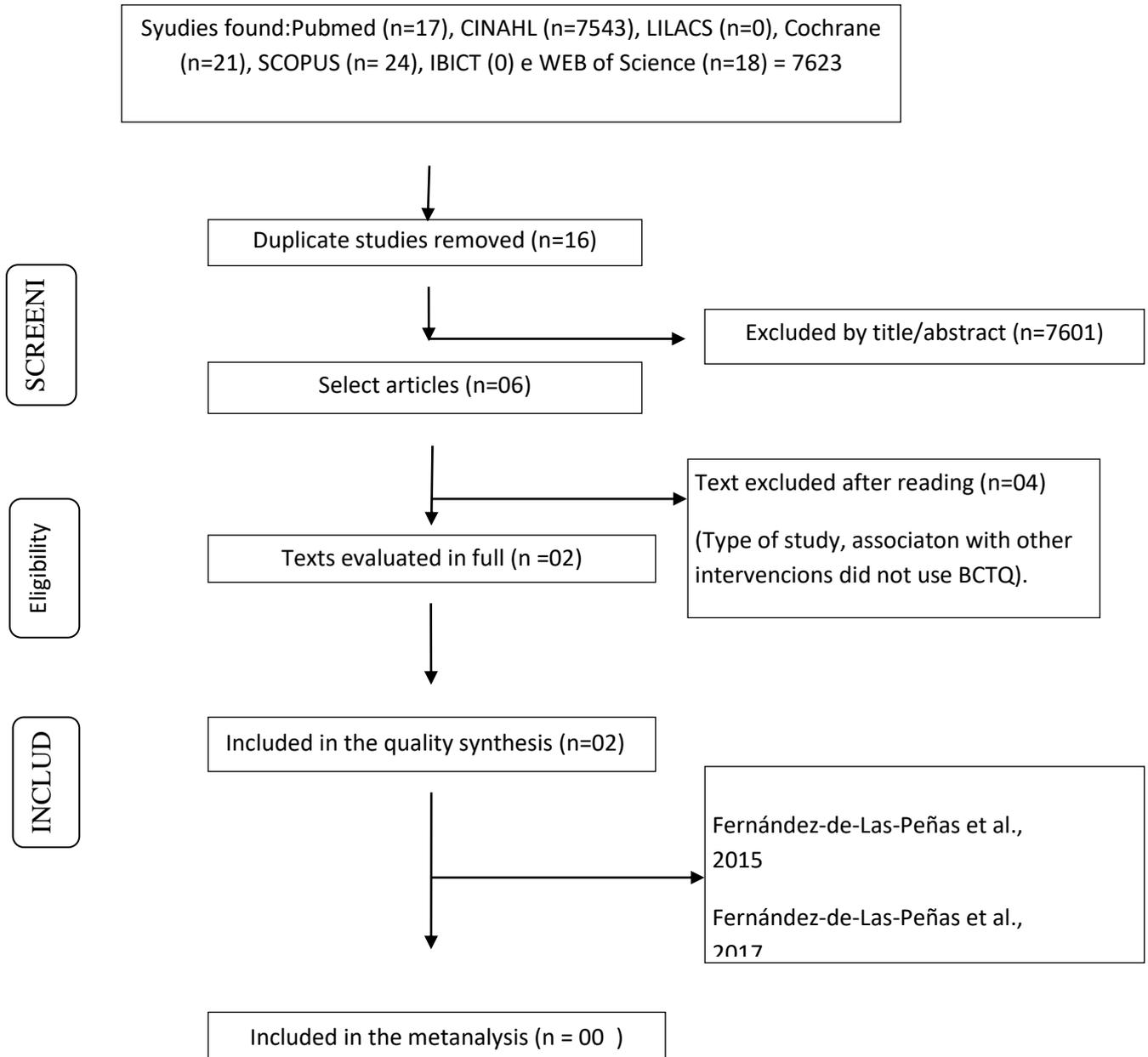
The selection of the studies was performed according to the inclusion and exclusion criteria of the research. The analyzes and article’s selection were performed by two independent evaluators (APAC and HKBF) with a third evaluator (SNB) for possible contradictions in the articles’ selection. The results were described and tabulated in Excel.

The tool used to analyze risk of bias was the Cochrane Handbook and the analysis of heterogeneity was used in the RevMan Program (Carvalho et al., 2013). The qualitative data of the characterization of the studies were statistically standardized and described in table 1. This systematic review was registered in PROSPERO under number CRD42018084250.

### **3. Results**

A total of 7623 title were screened, through the databases: PubMed (n = 17), CINAHL (n = 7543), LILACS (n = 0), CENTRAL (n = 21), SCOPUS (24), Web of Science (n=18) and research in IBICT Thesis and Dissertations Database (n = 0). Duplicate studies were excluded (n=16) and 7601 excluded by title and abstract, with 6 select articles for full text evaluation. From these, 4 articles were excluded due to different types of studies (n=2) and other associated interventions (n=2). These two articles (Fernández-De-Las Peñas et al., 2015; Fernández-de-las-Peñas et al., 2017) were included in the qualitative synthesis. The literature retrieval process is presented in the flowchart (Figure 1).

**Figure 1** - Search and selection of studies for systematic review in accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses).



Source: Prism flowchart - principal investigator file.

The studies included women, with mean age ranged from 46 to 57 years, with clinical diagnosis of CTS confirmed by the nerve conduction study and the hand's function were evaluated by the BCTQ, through two scales: Functional State Scale (FSS) that evaluates 8 activities performed with hand and the Severity of Symptoms Scale (SSS), which evaluates pain, numbness and weakness at night and during the day, with a results varying from 1 to 5, where higher scores means greater limitations and more symptomatology, before and after 1 month, 3 months, 6 months and 12 months after the final session of manual therapy or surgical decompression (Fernández-De-Las Peñas et al., 2015; Fernández-de-las-Peñas et al., 2017). Other measures were also evaluated, such as cervical range of motion and pinch force (Fernández-De-Las Peñas et al., 2015) and pain (Fernández-de-las-Peñas et al., 2017).

The trials (Fernández-De-Las Peñas et al., 2015; Fernández-de-las-Peñas et al., 2017) were randomized controlled conducted in Spain, who compared manual therapies with surgical decompression in relation to the functional status of the hand and severity of the symptoms in women with CTS. Interventions by manual therapy and surgical decompression were described in the studies (Table 1).

**Table 1** – Characteristics of selected studies.

Study	Design	Participants Sample size (n) Gender Mean age (range)	Intervention	Outcome measures	Main Results
Fernandez de la Peñas et al., (2015)	Randomized parallel- Group trial	N = 120 Female  G1 (n=60) 47 +- 10  G2 (n=60) 46 +- 9	G1 - Manual Therapy - 30min, 1X week. Total of 3 sessions. Desensitization maneuvers of the central nervous system (soft tissue mobilization, nerve and tendon gliding exercises (shoulder girdle depression, glenohumeral abduction and lateral rotation, supination of forearm and wrist, thumb and finger extension), manual techniques directed at anatomical sites of potential entrapment of the median nerve ( scalene, pectoralis minor, bicipital aponeurosis, pronator teres, transverse carpal ligament and palmar aponeurosis) lateral glides to the cervical spine and educational home session with tendon and nerve gliding exercise.  G2 - Surgery - Open or endoscopic decompression and reale of the carpal tunnel, based on surgeon's and patient's preferences and home educational session with the same tendon and nerve gliding exercises.	PRS SSS FSS GROC	Manual therapy group had a more effective response at 1 and 3 months but equally effective at 6 and 12 months improving function and pain compared to surgery group. Manual therapy and surgery group had similar results in symptom severity scores.
Fernandez de la Peñas et al., (2017)	Randomized parallel- Group trial	N = 100 Female  G1 (n=50) 46+- 9  G2 (n=50) 47 +- 8	G1 - Manual Therapy - 30min, 1X week. Total of 3 sessions. Maneuvers targeted to the cervical spine ( lateral glides applied to the cervical spine and posteroanterior pressure directed to the mid cervical spine) and potential entrapment of the median nerve ( shoulder, elbow, forearm, wrist and fingers). Soft tissue interventions targeting the scalene muscles, costoclavicle space, pectoralis minor, biceps brachii muscle, bicipital aponeurosis, pronator teres, transverse carpal ligament, palmar aponeurosis and lumbrical muscles. Cervical neck exercise program for stretching neck muscle and education session with cervical exercises.  G2 - Surgery - Open or endoscopic decompression based on surgeon's and patient's preferences and home educational session with the same cervical spine exercise tendon and nerve gliding exercises.	SSS FSS Cervical range of motion Pinch grip force	Manual therapy had better results improving function at 1 months compared to surgery and equally at 3, 6 and 12 months between the two groups. Surgery and manual therapy group had similar effectiveness for symptom severity and pinch-tip grip force. Cervical range of motion did not change in either group

NPRS: Numerical Pain Rating Scale; SSS: Symptom Severity Scale; FSS: Functional Status Scale; GROC: Global Rating of Change. Source: Principal investigator file.

The total size was satisfactory in all the studies (Fernández-De-Las Peñas et al., 2015; Fernández-de-las-Peñas et al., 2017). Types of intervention were heterogeneous among the studies, one performed desensitization maneuvers of the central nervous system with soft tissue mobilizations and tendon and neural gliding at all possible sites of entrapment of median nerve along the upper member and cervical limb and home patients education with tendon and neural gliding exercise (Fernández-De-Las Peñas et al., 2015), the other used cervical manipulations and along possible sites of entrapment (shoulder, elbow, forearm, wrist and fingers), soft tissue manipulation, cervical musculature stretching and home patients education with cervical exercises (Fernández-de-las-Peñas et al., 2017).

The duration of the manual therapy sessions was 30 min, once a week, in total of 3 sessions performed by manual therapists with more than 6 years (Fernández-De-Las Peñas et al., 2015) and over 10 years of experience (Fernández-de-las-Peñas et al., 2017). None of the studies reported adverse effects on the treatment and both reported sample size calculation based on data from the literature (Fernández-De-Las Peñas et al., 2015; Fernández-de-las-Peñas et al., 2017).

Regarding the primary and secondary outcome evaluation, the studies presented their results clearly and reported effect on CTS. One study showed in the manual therapy group an improvement of function in 1 and 3 months compared to surgery group. At 6 and 12 months, changes were similar in both groups. (Fernández-De-Las Peñas et al., 2015). The other study, the manual therapy group showed an improvement in function in 1 month compared to surgery group. Changes in function were similar in both groups at 3, 6 and 12 months (Fernández-de-las-Peñas et al., 2017). The analyzed studies showed similar improvements in the severity of symptoms between the manual therapy group and surgery group in relation to 1, 3, 6 and 12 months (Fernández-De-Las Peñas et al., 2015; Fernández-de-las-Peñas et al., 2017).

#### **4. Discussion**

The purpose of this review was to assess the evidence for the efficacy of manual therapies compared to surgical decompression in hand function in women with CTS. A meta-analysis combining the results from the trials was not feasible due to the heterogeneity of the interventions in the identified studies.

The trials presented a low risk of selection bias, adequately performed the randomization and allocation concealment (Fernández-De-Las Peñas et al., 2015; Fernández-de-las-Peñas et al., 2017), certifying the treatment effect by performing randomization and balancing the characteristics between the groups when randomly allocation the participants with independent researcher, avoiding confounding factors, as well-defined inclusion criteria in order to homogenize the sample.

The obscure risk of execution bias was in both trials, due to non-blinding of the manual therapist performing the intervention and patients, unavoidable blindness in manual therapy, since the therapist personally perform the maneuvers in the participants, but the evaluators were blind and did not perform the intervention, ensuring a low risk of detection bias.

The risk of attrition was low, the article described their losses and exclusion through the study and their losses were balanced between the groups. The reporting of the data was also low risk since they developed their primary and secondary outcomes.

The use of a rigorous methodological criteria is a strength of this systematic review. Based on the bias analysis (Figure 2), the critical evaluations of the studies were of low risk of bias since they were able to minimize the possible risks of bias.

**Figure 2** - Analysis of the risk of bias of the studies.

	Random sequence generation ( selection bias)	Allocation concealment (selection bias)	Standard reference (performance bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)
<b>LEGENDS</b>							
 Low risk of bias							
 Unclear risk of bias							
 High risk of bias							
Fernandez de La Peñas et al (2015)							
Fernandez de La Peñas et al (2017)							

Source: Cochrane Risk of Bias Tool - principal investigator file

Limitation were also found, since the trials were not performed in multicenter or distinct centers and the small number of manual therapy sessions, although there is no adequate dosage for better results, but more sessions may allow better results.

## 5. Conclusion

Despite the small number of studies analyzed, that precludes a strong conclusion, the high methodological rigor of the randomized controlled trials was fundamental to support that manual therapy may have similarly effective in relation to surgery decompression in improving hand function, analyzed by function gain and symptoms severity. The results suggest that manual therapy may be the first treatment option for women with CTS in relation to hand function because it has fewer risks and the same long-term gains as compared to surgical decompression. Future research need to focus on standardized the interventions protocol and take consideration into the numbers of session in the manual therapy intervention.

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