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Cochrane Corner

Comparison of surgical and non-surgical approaches in the treatment of carpal tunnel syndrome: A Cochrane Review summary with commentary

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The aim of this commentary is to discuss from a rehabilitation perspective the Cochrane Review "Surgical versus non-surgical treatment for carpal tunnel syndrome"[1] by Lusa et al., published by Cochrane Neuromuscular Group. This Cochrane Corner is produced in agreement with the Turkish Journal of Physical Medicine and Rehabilitation by Cochrane Rehabilitation with views* of the review summary authors in the "implications for practice" section.

Carpal tunnel syndrome (CTS) is the most prevalent nerve compression syndrome that occurs when the median nerve is compressed due to various causes, leading to reduced blood flow (ischemia) and subsequent damage to the myelin and axons.[2-6] Despite its prevalence, there is no universally accepted approach to treating patients diagnosed with CTS.[7] Non-surgical treatments for CTS operate by employing mechanisms such as reducing pressure on the median nerve, modifying the length of the nerve bed through mechanical interventions, and alleviating inflammation.[8,9] Surgical intervention, known as carpal tunnel release (CTR), entails the division of the transverse carpal ligament through various techniques, aiming to alleviate pressure within the carpal tunnel.[4]

Currently, there is uncertainty regarding which patients are best suited for conservative versus surgical methods in the treatment of CTS. The characteristics of the patient population for whom surgery may be more beneficial in CTS have not been clearly defined, indicating a need for further research. This Cochrane Review[1] aimed to identify evidence regarding the effectiveness of surgical versus non-surgical treatments for CTS.

Surgical versus non-surgical treatment for carpal tunnel syndrome (Lusa et al., 2024)

What is the aim of this Cochrane review?

The objective of this Cochrane Review was to evaluate the evidence concerning the benefits and harms of CTR compared to non-surgical treatment approaches in both the short term (less than three months) and long term (more than three months).

What was studied in the Cochrane review?

The population addressed in this review were individuals (of all ages and genders) experiencing symptoms of varying severity and duration related to CTS. The included studies were both published and unpublished randomized controlled trials assessing the efficacy of surgery compared to no treatment, placebo treatment, or any non-surgical intervention in managing CTS. The authors included studies encompassing all surgical techniques [such as mini-incision, open or endoscopic carpal tunnel release

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[1]*This summary is based on a Cochrane Review previously published in the Cochrane Database of Systematic Reviews Reviews 2024, Issue 1. Art. No.: CD001552. doi: 10.1002/14651858.CD001552.pub3 (see www.cochranelibrary.com for information). Cochrane Reviews are regularly updated as new evidence emerges and in response to feedback, and Cochrane Database of Systematic Reviews should be consulted for the most recent version of the review.*

**The views expressed in the summary with commentary are those of the Cochrane Corner author(s) (different than the original Cochrane Review authors) and do not represent the Cochrane Library or Wiley.*

(OCTR; ECTR) and other unspecified techniques] as well as all non-surgical treatment approaches.

The primary outcome, as defined by the study authors, was clinical improvement, which varies in definition from study to study: significant relief of symptoms or pain, or improvement in function from baseline. Secondary outcomes included symptom severity and function, typically measured using scales, pain assessed with visual analog scale (VAS) and numerical rating scale, evaluation of quality of life through patient-reported measures, assessment of adverse effects, and determination of the need for surgery. Adverse effects were evaluated at the final time point of the studies. These included the formation of a painful neuroma of the palmar cutaneous branch of the median nerve, tender or hypertrophic scar, section of the motor branch, subluxation of flexor tendons, wound infection, and complex regional pain syndrome. All other outcomes were evaluated as short-term (three months or less) and long-term (more than three months).

Search methodology and up-to-dateness of the Cochrane review?

The review authors conducted searches for studies published up to November 2022 across various electronic databases, such as the Cochrane Neuromuscular Specialised Register, CENTRAL, Embase, MEDLINE, ClinicalTrials.gov, and WHO ICTRP. Additionally, studies from the previous iteration of this review were also included.

What are the main results of the Cochrane review?

A total of 14 studies were included, comprising four studies from the previous version of the review, one study previously awaiting classification, now included, and nine newly added studies. The included trials were conducted in 10 countries, namely China, Egypt, Hong Kong, Iran, Pakistan (two studies), Spain (four studies), the Netherlands, Türkiye, United Kingdom, and the United States of America. All participants diagnosed with CTS, as defined by the authors, were included, regardless of the diagnostic criteria used. A total of 1231 participants were included, with participant numbers ranging from 22 to 176 per trial. Most of the participants were female (84%), and the mean age ranged from 32 to 53 years. The mean duration of symptoms ranged from 31 weeks to 3.5 years, and the severity of CTS generally ranged from mild to severe.

All studies included in the review compared surgery with other therapies; none involved placebo surgery or no treatment. The surgery groups in the studies underwent CTR using various techniques chosen based on surgeon and patient preferences. The results are relevant for comparing nonsurgical treatments with surgery:

- OCTR *vs.* plaster of Paris splint, custom-made splint, or a prefabricated splint
- OCTR *vs.* splint *vs.* splint and corticosteroid injection (20 mg triamcinolone acetonide and 20 mg lidocaine mixture)
- Mini-incision *vs.* corticosteroid injection (20 mg/mL of methylprednisolone)
- Surgical decompression *vs.* corticosteroid injection (15 mg of methylprednisolone acetate or 40 mg of methylprednisolone or 40 mg/mL of triamcinolone acetonide)
- Limited palmar incision technique *vs.* corticosteroid injection (20 mg/mL of paramethasone acetonide)
- OCTR or ECTR *vs.* manual therapy
- OCTR or ECTR *vs.* multimodal non-operative treatment, involving medication, hand therapy, exercises, splinting, and ultrasound therapy
- OCTR *vs.* ultrasound-guided platelet-rich plasma (PRP) injection *vs.* unspecified medical treatment including hand support
- Miniscalpel-needle release and corticosteroid injection *vs.* corticosteroid injection alone (1.0 mL of compound betamethasone: 2 mg betamethasone sodium phosphate and 5 mg betamethasone dipropionate, with 1.0 mL of 1% lidocaine)

Co-interventions varied across the studies. Six studies reported the use of pain medication after treatment, while seven did not provide information about postoperative pain medication. One study explicitly stated that pain medication was not allowed during the follow-up period. Additionally, three studies included exercises as part of both surgical and non-surgical treatments, to be performed as homework if necessary.

The primary outcome across nine studies was clinical improvement, with various measurement scales utilized: improvement was defined as a change of at least two grade scores on a VAS, a minimum of 50% reduction in a global symptom score, patient satisfaction assessed using a 5-point scale, the percentage of wrists achieving specific reductions in VAS scores for various symptoms reported, the proportion of participants completely relieved of

symptoms documented, improvement determined using a 6-point ordinal transition scale, success defined through improvements in Carpal Tunnel Assessment Questionnaire (CTSAQ) scores and pain interference scales, and self-perceived improvement measured using a Global Rating of Change scale. However, five studies did not assess this outcome.

The severity of symptoms was measured in 10 studies using different scales: seven used the Boston Carpal Tunnel Questionnaire (BCTQ) Symptom Severity Scale, two used the global symptom score, and one used the CTSAQ 11-item Symptom Severity Scale, which is likely equivalent to the BCTQ Symptom Severity Scale.

Function was assessed in nine studies using various measurement scales. Seven studies utilized the BCTQ Functional Status Scale, while one study employed the CTSAQ 9-item Functional Status Scale. Additionally, one study utilized a VAS to measure function.

Pain was evaluated in seven studies, employing different measurement scales. Four studies utilized a VAS, while three studies used the 11-point Numerical Rating Scale. However, one study using VAS did not report the results. The remaining studies did not measure this outcome.

Three studies included assessments of health-related quality of life (HRQoL), with the EQ-5D scale being utilized in two studies, and the 36-Item Short Form Health Survey (SF-36) in another study.

Ten studies measured and reported on adverse effects. Additionally, eight studies reported on the need for further surgery, including primary CTR after non-surgical treatment or reoperation after surgery for any reason.

Surgery versus splint

The comparison between surgery and splinting involved three studies, evaluating short-term outcomes at three months and long-term outcomes at 6, 12, and 18 months. Initially, there was no significant difference in short-term outcomes, but sensitivity analysis favored surgery (Clinical improvement, 95% CI 0.48 to 2.34; symptoms, 95% CI 0.83 to 0.87; function, 95% CI 0.44 to 0.44). In the long term, surgery showed superiority in clinical improvement (95% CI 1.04 to 4.24), with moderate-certainty evidence. However, adverse effects were more common with surgery (60/98 *vs.* 46/112; RR 2.11, 95% CI 0.37 to 12.12), and long-term analysis suggested a higher likelihood of needing surgery in the splinting group (0/83 *vs.* 41/93; RR 0.03, 95% CI 0.00 to 0.21).

Surgery versus corticosteroid injection

For surgery versus corticosteroid injection, short-term analysis indicated lower rates of clinical improvement with surgery (57% *vs.* 78%; RR 0.75, 95% CI 0.60 to 0.92), while long-term outcomes were inconclusive (73% *vs.* 62%; RR 1.23, 95% CI 0.73 to 2.06). No significant difference was observed in symptom relief, function, or pain outcomes between the two treatments. Adverse effects were more frequent with surgery, but evidence certainty was low (3/45 *vs.* 2/45; RR 1.49, 95% CI 0.25 to 8.70). Overall, corticosteroid injection appeared advantageous in the short term.

Surgery versus splint + corticosteroid injection

In the comparison of surgery versus splint + corticosteroid injection, short-term results favored the combination treatment (Clinical improvement, 45% *vs.* 100%, RR 0.47, 95% CI 0.25 to 0.87), but long-term benefits were uncertain (Clinical improvement, 91% *vs.* 83%, RR 1.10, 95% CI 0.84 to 1.43). Symptom relief (The mean score was 1.96 with combination, and 0.55 better with surgery, 95% CI 0.87 to 0.23) and hand function (The mean function was 1.69 with combination, and 0.17 better with surgery, 95% CI 0.41 better to 0.07 worse) outcomes were inconclusive, and adverse effects were uncertain, although surgery had a higher incidence (2/11 *vs.* 0/23, RR 10.00, 95% CI 0.52 to 192.25). Further investigation is needed to determine long-term benefits.

Surgery versus PRP

Regarding surgery versus PRP injection, primary outcome data on clinical improvement were not reported. While surgery might offer slight benefits in pain relief compared to PRP injection (the mean score was 1.97 with PRP and 0.43 better with surgery, 95% CI 0.03 better to 0.83 better), evidence regarding hand function and clinical outcomes remains uncertain, requiring further investigation.

Surgery versus manual therapy and surgery versus multimodal non-operative treatment

In studies comparing surgery with manual therapy (93% *vs.* 71%, RR 1.31, 95% CI 1.09 to 1.57) and multimodal non-operative treatment (45% *vs.* 27%, RR 1.67, 95% CI 0.97 to 2.88), evidence suggests that

surgery likely resulted in a higher rate of clinical improvement in the long term, but there were no significant differences in symptom relief, function, or pain outcomes between surgery and manual therapy or non-operative treatment. Adverse effects were not reported consistently, and the need for surgery or secondary procedures was uncertain.

Surgery versus unspecified medical treatment and hand support

In a comparison between surgery and unspecified medical treatment and hand support, surgery showed significant advantages in symptom severity (The mean score was 3.13 points with medical treatment and hand support and 2.1 points better with surgery, 95% CI not estimable due to reported standard deviation (SD) of 0.0 in the surgery group), hand function (The mean score was 2.81 with medical treatment and hand support and 1.74 better with surgery, 95% CI from 1.91 better to 1.57 better), and pain relief (The mean score was 7.74 with unspecified medical treatment and hand support and 5.34 better with surgery, 95% CI from 5.94 better to 4.74 better) over medical treatment and hand support. However, data on health-related quality of life, adverse effects, and the need for further procedures were lacking.

Surgery + corticosteroid injection versus corticosteroid injection

In a study combining surgery with corticosteroid injection versus corticosteroid injection alone, short-term analysis showed slight improvements with the combination approach (symptoms, 2.06 *vs.* 0.22, 95% CI from 0.35 better to 0.09 better; function, 2.08 *vs.* 0.28, 95% CI from 0.46 better to 0.10 better), but long-term outcomes were not reported conclusively. Further research is needed for definitive conclusions.

How did the authors conclude on the evidence?

The authors concluded that the efficacy of CTR for individuals with CTS remains unclear due to the lack of studies comparing it with placebo or no treatment. They emphasized that surgery is often chosen for its perceived long-term benefits rather than short-term symptom relief. While surgery may not provide immediate benefits compared to non-surgical treatments, the decision to undergo surgery should take into account the modest benefits it offers, balanced against the potential risks. It's important to note that in the long term, the advantages of surgery are relatively minor in comparison to non-surgical treatments.

In terms of patient selection, surgery may be considered for individuals with severe symptoms and a strong preference for definitive management. Those with less severe symptoms and a desire to avoid surgical complications might find non-surgical treatment modalities preferable. Surgery may be an option if non-surgical methods fail to provide satisfactory relief, but it's uncertain whether surgery significantly outperforms continuing non-surgical treatments.

Regarding adverse effects, the authors noted uncertainty about potential differences between surgical and non-surgical treatments. However, they highlighted rare yet severe adverse effects associated with surgery, such as deep wound infections, systemic infections, or nerve injuries, stressing the importance of informing patients about these risks.

What are the implications of the Cochrane evidence for practice in rehabilitation?

This Cochrane review highlights the ongoing uncertainty regarding the clinical efficacy of CTR in the management of CTS. Future research should focus on comparing the effectiveness of surgical and non-surgical interventions, including placebo-controlled studies. Randomizing patients who have tried non-surgical options is crucial. Treatment-naïve patients are not typical candidates for surgery but if they are studied, long-term follow-up are recommended to understand long-term effects better. Studies specifically addressing severe CTS would provide valuable insights.

To minimize potential biases, double-blind study designs should be strongly considered, accompanied by strategies aimed at discouraging premature surgical intervention. Establishing minimal clinically important difference of the BCTQ would aid in result interpretation.

Moreover, the review[1] highlights the importance of conservative methods in the management of CTS. Therefore, there is a need to increase research on approaches such as splints, physical therapy modalities, exercises, manual therapy, and injection techniques.[8-10]

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REFERENCES

1. 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:CD001552. doi: 10.1002/14651858.CD001552.pub3.
2. Huisstede BM, Fridén J, Coert JH, Hoogvliet P; European HANDGUIDE Group. Carpal tunnel syndrome: hand surgeons, hand therapists, and physical medicine and rehabilitation physicians agree on a multidisciplinary treatment guideline—results from the European HANDGUIDE Study. Arch Phys Med Rehabil 2014;95:2253-63. doi: 10.1016/j.apmr.2014.06.022.
3. Schmid AB, Fundaun J, Tampin B. Entrapment neuropathies: a contemporary approach to pathophysiology, clinical assessment, and management. Pain Rep 2020;5:e829. doi: 10.1097/PR9.0000000000000829.
4. Singh V, Ericson WB. Median nerve entrapments. In: Trescot AM, editor. Peripheral nerve entrapments: Clinical diagnosis and management. Anchorage: Springer, Cham; 2016. p. 369-82.
5. Padua L, Coraci D, Erra C, Pazzaglia C, Paolasso I, Loreti C, et al. Carpal tunnel syndrome: clinical features, diagnosis, and management. Lancet Neurol 2016;15:1273-1284. doi: 10.1016/S1474-4422(16)30231-9.
6. Stevens JC. AAEM minimonograph #26: the electrodiagnosis of carpal tunnel syndrome. American Association of Electrodiagnostic Medicine. Muscle Nerve 1997;20:1477-86. doi: 10.1002/(sici)1097-4598(199712)20:12<1477::aid-mus1>3.0.co;2-5.
7. Rosenbaum RB, Ochoa J. Carpal tunnel syndrome and other disorders of the median nerve. 2nd ed. Boston, MA: Butterworth Heinemann; 2002.
8. Duymaz T, Sindel D, Kesiktaş N, Müslümanoğlu L. Efficacy of some combined conservative methods in the treatment of carpal tunnel syndrome: a randomized controlled clinical and electrophysiological trial. Turk J Rheumatol 2012;27:38-46. doi: 10.5606/tjr.2012.005.
9. Carlson H, Colbert A, Frydl J, Arnall E, Elliot M, Carlson N. Current options for nonsurgical management of carpal tunnel syndrome. Int J Clin Rheumtol 2010;5:129-142. doi: 10.2217/IJR.09.63.
10. Jiménez Del Barrio S, Bueno Gracia E, Hidalgo García C, Estébanez de Miguel E, Tricás Moreno JM, Rodríguez Marco S, et al. Conservative treatment in patients with mild to moderate carpal tunnel syndrome: A systematic review. Neurologia (Engl Ed) 2018;33:590-601. doi: 10.1016/j.nrl.2016.05.018.