Journal of Hand Therapy 36 (2023) 528–535

Contents lists available at ScienceDirect

Journal of Hand Therapy

journal homepage: www.elsevier.com/locate/jht

A systematic review of the effectiveness of wrist manipulative therapy in patients with lateral epicondylitis

Charu Eapen, PhD*, Rachel Rosita, MPT, Madhura S. Sohani, MPT, Vivek D. Patel, MPT

Department of Physiotherapy, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India

ARTICLE INFO

Article history:
Received 30 October 2021
Revised 5 October 2022
Accepted 9 October 2022
Available online 12 March 2023

Keywords:
Lateral Epicondylitis
Manipulative therapy
Wrist manipulation
Systematic Review

ABSTRACT

Study Design: Systematic review.
Introduction: Several treatment methods treat lateral epicondylitis, but there is no consensus regarding the most effective method. Research has suggested that joint mobilizations may help recover patients with lateral epicondylitis.
Purpose of the Study: To determine if wrist joint manipulations effectively improve pain, grip strength, ROM, and functional outcome in adults with lateral epicondylitis.
Methods: Searches were performed in 6 databases to identify relevant clinical trials. Three reviewers independently extracted data and assessed the methodological quality using the PEDro scale. Standard data were extracted and summarized.
Results: A total of 4 studies met the inclusion criteria. A best-evidence synthesis was used to summarize the results. The included studies found effectiveness in favor of wrist manipulations given for at least 3 weeks to reduce pain in lateral epicondylitis against comparison groups comprising ultrasound, laser, friction massage, and exercises. Functional outcomes varied considerably among studies. Grip strength showed varied results, and no effect was seen on wrist ROM.
Conclusion: The evidence is convincing that wrist joint manipulations positively affect pain in the short term, compared to comparison groups in the management of lateral epicondylitis. Future high-quality studies are recommended.

Introduction

Lateral epicondylitis (LE) is a chronic degenerative condition associated with pain on the lateral epicondyle of the elbow at the common extensors origin of the forearm.[1] It is recognized by fibroblast proliferation, vascular hyperplasia, and immature collagen fibers.[2] There are differences regarding the role of inflammation in LE,[2] but the associated tissue pathology needs to be recognized for the pain mechanism.[3] Pain is usually present with wrist extension. Activities requiring repeated and forceful contraction of the wrist extensors are commonly associated with the extensor carpi radialis brevis (ECRB) tendon involvement.[4] It usually acts on the dominant upper limb, which involves repeated forceful movements.[5] LE is present in 1%-3% of adults in the general population,[6,7] and 2%-23% among occupational populations.[7,8] More or less 40%-50% of players who play tennis leisurely will suffer this condition once in their lifetime.[9] A recent study has reported the incidence of LE in this population to be about 3.3 to 3.5 per 1000.[10] People aged between 45 and 54 years, and women show a higher predisposition towards getting a LE diagnosis.[10]

LE can be a self-restricting condition, with 89% of those detected reporting a decrease in pain at 1 year[11] On the other hand, it can become chronic in nearly 40% of diagnosed cases, leading to impaired function[12] and considerable economic costs for the individuals with chronic LE.[6]

A variety of physiotherapy treatment options have been recommended for LE.[13] According to a recent systematic review and meta-analysis,[14] patients treated conservatively reported statistically and clinically improvement in pain and functional scores compared to placebo or injections. Hence, it was recommended that conservative treatment be prioritized before considering other interventions,[14] Another study found the minimal evidence to utilize passive physical modalities like shockwave therapy, low-level laser therapy, transcutaneous electrical nerve stimulation, or elbow brace for the treatment of lateral epicondylitis.[15] MET and

* Corresponding author. Dr. Charu Eapen, Department of Physiotherapy, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Karnataka, India. Tel.: +91-0824-2445858.
E-mail address: charu.eapen@manipal.edu (C. Eapen).

0894-1130/$ – see front matter © 2022 Elsevier Inc. All rights reserved.
https://doi.org/10.1016/j.jht.2022.10.002

myofascial release techniques are observed to be effective in treating LE.[16,17] Manual therapy approach to the cervical spine, elbow, and wrist, may relieve discomfort and increase pain-free grip strength immediately following treatment; however, there is inadequate evidence of any long-term therapeutic effects of manual therapy alone.[13] A recent review by Lucado et al. [18] concluded that there was an evidence to support movement with mobilization or Mill's manipulation as an intervention in treating patients with LE, with noticeable improvement in pain and grip strength. However, most of the studies in this review used some form of exercise and mobilization. The authors also concluded that regional mobilization to the wrist or cervical spine might be beneficial, but they were not discussed in detail.[18] There are limited studies specifically considering wrist mobilization in LE. Only 2 studies[19,20] have been reported so far on wrist mobilizations. The mechanism by which wrist mobilization works on LE is not described though it has been suggested that forearm muscles' stretching that is commonly recommended in the treatment of LE may result in the freeing up of displaced motion segments,[19] hence there is a need to see if wrist mobilization has any effect on LE. Therefore, a detailed evaluation of the current literature is required to investigate the distinct effect of wrist joint mobilizations on LE symptoms and to analyze and pool data, if possible, further quantitatively. For clinicians treating patients with LE, such a quantifiable detail may provide a more evident course of treatment with wrist mobilizations. As a result, the goal of this systematic review was to see if wrist joint mobilization improves pain, grip strength, range of motion, and disability in patients with LE compared to physiotherapy consisting of electrical modalities and or exercises.

Methodology

Eligibility criteria

The inclusion criteria of the studies for this review consisted of randomized control trials, adults aged 18 and up who have been clinically diagnosed with LE, and Outcomes of primary interest being pain, disability, and grip strength, which were written in English. They were rated as 4 points or greater on the "11-point Physiotherapy Evidence Database (PEDro)" quality assessment scale. According to the PEDro scale, studies with a score of $\geq$ 9 and 10 are considered excellent methodological quality, scores $\geq$ 6 and up to 8 are considered good quality, $\geq$ 4 and up to 6 are considered fair, and $<$ 4 are considered as studies of poor quality.[21] The scoring was done by 2 independent reviewers (MS, RR). An independent reviewer (CE) solved any divergence in score assessment.

"Wrist joint mobilization was defined as an intervention to the wrist joint that included scaphoid thrust with active or passive wrist extension imparted by one or more health maintenance disciplines including physical therapists, occupational therapists, or chiropractors to treat pain, ROM, and strength deficits, and functional impairments related to LE."

Joint mobilization of the cervical spine or elbow and soft tissue mobilization were omitted from the study.

Information sources and search strategy

An extensive English language literature search was carried out using the subsequent databases: PEDro, Embase, ProQuest, Web of Science, Cochrane, and PubMed from inception to June 2021. The search strategy was first developed using MESH terms and keywords in the PubMed database and then adapted for use in additional databases. Several different combinations of keywords were used such as "tennis elbow," "Lateral epicondylitis," "Lateral elbow pain," "Elbow tendinitis," "Lateral humeral epicondylitis," "tendonitis," "epicondylitis," "humeral epicondylitides," "lateral epicondylalgia," "Wrist Mobili*," "Wrist manipula*," "Movement with mobili*," "Maitland," "manual therapy technique," "Chiropractic manipula*," "Mulligan," "Wrist joint manipula*," "Wrist joint mobili*," "Carpal mobili*," "Kaltenborn's," "Pain," "VAS" "NPRS."

Our searches were conducted using the English language and the RCT filter. Hand searches of reference lists of reviewed publications and earlier systematic reviews were also undertaken.

Study selection

Two reviewers (MS and RR) evaluated all titles and abstracts for their relevance to the therapeutic management of LE using wrist joint manipulation as an intervention. Full-text papers qualified through the abstract were procured after the criteria's met for an in-detail review, quality assessment, and conclusive comment.

Data extraction and analysis

Standard data were extracted for the chosen studies. Design of the study, recruitment setting, inclusion and exclusion criteria, sample characteristics, mobilization technique, Control/comparative condition(s) studied, treatment parameters, outcome measures, and effects of interventions at short, mid, and long-term follow-up were all collected. Follow-up time frames were separated into 3 categories for this review: long-term (>6 months), mid-term (>3 months-6 months), and short-term (<3 months), as research differed widely in their follow-up duration.

Quality assessment

MS, RR, and CE, 3 independent reviewers, assessed the PEDro rating scale of 11 items, which has good interrater reliability[22,23] and it shows strong convergent validity with a Cochrane Risk of Bias Tool summary score of 0.83 (95 percent CI: 0.76-0.88), was used to assess eligible studies for methodological quality.[23,24] Fair to good interrater reliability has been recorded, with an ICC of 0.55 (95 percent CI.41-.72). The PEDro scale is an 11-item checklist designed to assess the quality of randomized controlled trials. Internal validity is addressed in items 2-11, while external validity is addressed in item 1. Each item on the checklist is given a yes or no score, with yes getting a one and no getting a zero. The accuracy of published operational definitions of PEDro scale items was checked before scoring. With a maximum possible score of 10/10, overall scores were obtained by summing the total number of items marked yes. Item 1 was eliminated from the overall score because it has nothing to do with the internal validity of the study. Given the near-impossibility of blinding treating therapists and subjects in manual therapy trials, the most excellent PEDro score that could be achieved was estimated to be 8/10. For this review, studies were considered high quality if they received a score of 6 or higher, fair quality if they received a score of 4-5, and poor quality if they received a score of 3 or lower.[21] An impartial reviewer (VP) who was not engaged in the initial article quality assessments settled any disagreements.

Result

Study selection

The number of articles that qualified after this review's criteria met was 4. A total of 191 articles were primitively recognized for potential inclusion. Of these, 21 were identified as duplicates. Based on the title and abstract search, 155 articles were excluded. Of these, 15 papers were deemed eligible for full-text review. We

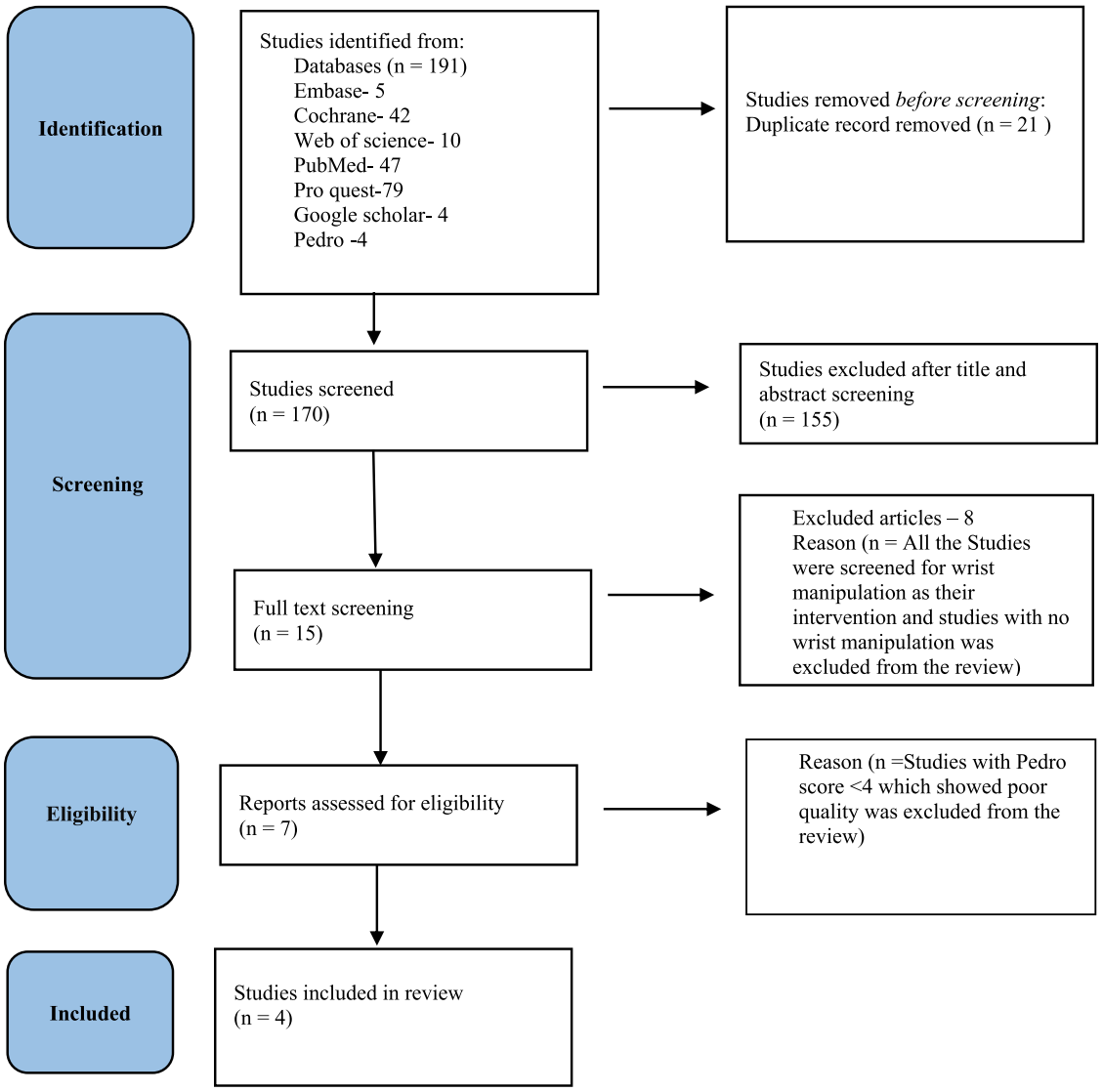

Fig. 1. Study selection process summarized in the PRISMA flow diagram.

excluded 8 studies because they were inappropriate interventions like Mobilization with movement (MWM) for the elbow and cervical, and another three were excluded for poor quality. The process of selection of studies is outlined in the Preferred Reporting Items for Systematic Reviews and Meta-analyses flow diagram Figure 1

Study characteristics

Analysis of the selected studies revealed that all studies used a similar wrist mobilization technique.[19,20,25,26] However, a considerable variety was noted in the treatment methods of the control group. In the control groups in all but 1 study,[25] were subjected to ultrasound therapy with friction massage, stretching, and strengthening exercises or MWM for the elbow.[19,20] Sharma et al. in their trial, delivered only low-level laser therapy treatment to the control group.[25] The studies that were chosen reported several outcome indicators such as pain, function, and grip strength. The pain was assessed in all the selected studies, either using the VAS[20,26] or NPRS.[19,25] The pain-free or maximum grip strength, range of motion at the elbow joint, pain pressure threshold at the lateral epicondyle, and the tools used to assess disability based on self-reported functional outcomes varied between studies.

The study population was drawn from the general population and was not restricted to any particular industry or sporting group in all studies. All studies had a well-defined time limit for symptoms. All studies included subjects experiencing pain for a minimum duration of 6 weeks. Two of the 4 studies included in the review limited the duration of symptoms to 6 months.[19,20] The demographic details of the participants in the included studies are summarized in Table 1. A couple of studies also checked for positive cozens test.[25,26] Patients with only unilateral symptoms were included in some studies,[19,20] and the others did not specify the distribution of symptoms or special tests. No study specified limiting inclusion to only first-time versus recurrent episodes of LE. All studies included males and females, with variable gender distribution between studies. The age group of the participants in the included studies was from 22 to 55 years. The selected studies had a total sample size of 101 subjects.

Exclusion criteria

Two studies, Strujis et al.,[19] and Joshi et al. [20] excluded the patients based on the specific criteria which were similar like no restriction in range of motion, subjects with bilateral complaints,

Table 1
Summaries of the demographic details for participants in the included studies

Study	Number of participants	Age(Mean/Range)	Symptom duration
Strujis et al.[19]	31	46.5 / 47.5	6 wk-6 mo
Joshi et al.[20]	10	Not clear in the study	6 wk-6 mo
Sharma et al.[25]	30	25-50	More than 6 wk
Manchanda et al.[26]	30	22-55	4-12 wk

Table 2
PEDro scores of included studies

Author Year	1	2	3	4	5	6	7	8	9	10	11	Total
Strujis et al.[19] (2003)	√	√	√	√	×	×	√	√	×	√	√	7 /10
Joshi et al.[20] (2013)	√	√	×	√	×	×	×	√	√	√	×	5 /10
Sharma et al.[25] (2020)	√	√	×	√	×	×	×	×	×	√	√	4 /10
Manchanda et al.[26] (2008)	√	√	×	√	×	×	×	×	×	√	√	4 /10

absolute decrease in pain for last 2 weeks, presence of any neck or shoulder problems causing the elbow pain to worsen Strujis et al.[19] also mentioned an inability to fill out the global outcome questionnaire as one of the exclusion criteria. Sharma et al.[25] and Manchanda et al.[26] excluded patients who had already received a dose of steroid injection within 30 days. Patients with pathoneurodynamics involving the elbow or other neurological or systemic disorders like stroke and radiculopathy were also excluded from the study, whereas trauma, surgery, any acute infections, dysfunctions involving the cervical spine were excluded by Manchanda et al.[26]

Risk of bias in selected studies

Analyzing the risk of bias in each study can aid in avoiding overestimation or underestimation of treatment effects. Limitations in the selected studies impact the validity of the systematic review. The PEDro scale was used to assess the quality of each chosen study. A complete analysis of PEDro scores by criteria for all articles is given in (Table 2).

Pedro criteria: 1. eligibility criteria are Specified; 2. random allocation to groups; 3. allocation was concealed; 4. group similarity at baseline; 5. blinding of subjects; 6. blinding of therapists; 7. blinding of outcome assessors; 8. measurement of at least 1 key outcome obtained from at least 85% of the group; 9. intention-to-treat analysis for at least 1 key outcome; 10. between-group comparison for at least 1 key outcome; and 11. reported point measurements and measurements of variability for at least one key outcome."

A risk of bias assessment was done for 7 articles included after full article screening.[19,20,25-29] Except for 1 study in this review, all studies included randomization of assignment.[30] Only 1 study used concealed allocation.[19] In all but 2 studies, baseline comparisons of at least 1 key outcome measure were performed to establish homogeneous groups prior to the studied intervention.[27,28] No study could fulfill the criteria of blinding the subject and therapist. Blinding of the assessor was done in only 1 study.[19] In all included studies, at least 1 outcome measure was subjected to a between-group analysis. Only 3 studies provided point estimates and variability estimates.[19,25,26] Out of initially allocated subjects' the key outcome was not obtained for at least 85% population in the 2 studies.[25,26] Three studies stated that all subjects do not receive the treatment as allocated.[19,25,26] Out of these 7 articles, 3 articles were excluded because of poor methodological quality.[27-29]

Wrist manipulation

The forearm of the patient was kept supported on the table with the palm facing downward. The therapist sat perpendicular to the subject's injured side, his/her thumb and index finger gripping the subject's scaphoid bone. The therapist reinforced the grip by placing the other hand's thumb and index finger on them. The therapist then extended the subject's wrist dorsally while the scaphoid bone was manipulated ventrally. About 10-15 repetitions were given.[19,20,25,26]

The interventions were looked at in isolation by 2 studies.[19,20] The residual studies examined the wrist manipulation in the background of a multimodal treatment administration, including identical interventions used in a control group like exercise, stretching, ultrasound, friction massage, and low-level laser therapy.[25,26]

Effect on pain

Two studies used NPRS to measure pain[19,25] and the other used VAS.[20,26] In all the studies, the pain was measured at the beginning of the treatment. Two studies[19,20] measured pain intensity at the moment and pain throughout the day, one asked about pain in the previous 24 hours,[26] and another [25] did not mention any parameters regarding the same. Three studies.[19,20,25] showed a significant decrease in pain. One study[26] did not show any significant decrease, where the pain was measured on day 15th, compared to the other studies where the pain was assessed after a minimum of 3 weeks.

Effect on ROM

Only 2 studies assessed wrist ROM as a secondary outcome measure.[19,20] Both the studies did not find any significant difference between the conservative and wrist manipulation group at the end of 6 weeks.

Effect on Grip strength

Two studies[19,20] used pain-free grip strength and maximum grip strength as their outcome measure, where the grip force was measured in kilograms with a Jamar hand dynamometer. Sharma et al.[25] used grip strength, assessed with a handheld Dynamometer, and Manchanda et al.[26] measured pain-free grip strength in a position where the hand was supported on the table with the

wrist in extension, elbow extended, and forearm pronated by the patient's capability to lift the weight on their own and then using weights-1kg, 2kg or 3kg, etc. as needed without pain provocation. There was no improvement in one study after 6 weeks of intervention,[19] while the other 2 showed a significant improvement in grip strength at the end of intervention.[25,26] One study[20] did not report any change in pain-free grip strength after 3 weeks.

Functional outcome measures

Out of 4 studies included in this review, only 1 used the global measure of improvement scale as an outcome. Struijs et al.[19] used the Global measure of improvement, an 11-point scale, as their primary outcome. This scale was subjective. The data was taken on the third and sixth weeks of the intervention. After 3 weeks of intervention, 65% in group one showed more improvement than the other group, only 20%.[19] In another study, however, a functional pain scale on the tennis elbow was used to assess the subjects' physical function. Groups receiving manual therapy for elbow and wrist manipulation showed improvement in functional scale.[26]

All the included studies showed well-defined interventions and outcome measures (Table 3).

Discussion

Based on 3 studies of fair quality[20,25,26] and one of good quality[19] with a total of 101 participants, our findings suggest that pain was significantly reduced at a minimum of 3 weeks of intervention in the group that received wrist joint manipulation when matched to the comparison groups which showed no difference in the period of up to fifteen days. There were mixed results regarding grip strength and insufficient and varied functional outcome measures to comment on the effect on the functional aspect in LE.

The technique of wrist manipulation in all the studies was the same as described by Lwit[30] and developed by Strujis.[19] It consisted of several thrust maneuvers applied to the scaphoid with the palmar surface facing down with the wrist simultaneously extended for 15-20 minutes. This technique of wrist manipulation used in the included studies can be recommended as the choice of wrist manipulation technique in the management of LE. However, it was challenging to give recommendations for standard doses of the manipulation technique in terms of the number of sets per session and the total sessions/duration of the treatment time, which varied from 15 days to 6 weeks.

From the available evidence in this review, a good quality study[19] showed that there was a significant decrease in the pain after 6 weeks of intervention in the group that received wrist manipulation compared to the control group. However, the authors cautioned its implication owing to the small number of subjects ($n = 31$) resulting in low power. Similarly, the other 2 studies,[20,25] which showed a significant improvement in pain, had the same limitation of a small sample size ranging from 10 to 30 patients. Future research is recommended with larger sample size. Regarding the age group of the sample in these studies, it was seen that the age of the participants ranged between 22 and 55 years in 2 studies,[25,26] where the mean age was not defined compared to 46.5/47.5 years in another study.[19] and hence the generalizability to the age group cannot be commented. Though three of the four studies included patients with symptoms of more than 6 weeks,[19,20,25] the upper limit of duration was either 12 weeks,[26] 6 months,[19,20] or not mentioned[25]; hence the chronicity of the condition also needs to be considered when applying the results of this study.

However, the wrist manipulation technique does prove to be effective in reducing pain when given for a minimum of 3 weeks. In line with this, the previous systematic reviews have supported the usage of elbow mobilizations in treating LE in both the temporary and long-term.[18,31] One systematic review[18] on the effect of regional mobilization on LE emphasized the effect of elbow mobilizations like Mill's maneuver on grip strength and pain, but it mentioned that the data was insufficient for recommendation on wrist mobilizations. Based on the studies we have summarized, wrist manipulation significantly affected pain when given for 3 weeks or more for LE. Two of the three studies that showed a reduction in pain used wrist manipulation as a solo intervention in the experimental group. The mechanism by which mobilizations decrease pain is unclear and appears to be an interaction between mechanical and neurophysiological responses.[32] The mechanical stimulus from the manual therapy intervention results in neurophysiological responses within the peripheral and central nervous systems accountable for pain inhibition.[32] The potential mechanism to improve stiffness in the lumbar spine is reported to be changes in muscle activity, mobility, pain decrease, tissue behavior changes, or changes in the CNS or reflex pathways.[33] Similar effects may be seen in the case of LE with wrist manipulations.

In Grip strength testing is usually done in patients with LE because these patients commonly report pain with gripping activities and are expected to improve as symptoms subside.[34] Pain-free grip strength is a reliable and valid test to measure grip strength in LE.[35,36] In terms of the position of the elbow; maximum grip strength can be measured with the elbow extended or flexed with the forearm in a supported or unsupported position and grip strength decreases from a position of flexion to extension in LE.[37] The improved grip strength in the elbow extended position correlates significantly with a satisfactory clinical outcome.[38] In this review for grip strength testing, the maximum or the pain-free grip strength testing methods were used in the included studies. There was no clarity on the exact position used for grip strength testing in the included studies except for one[26]; hence from this review, it would not be possible to comment on the exact position and method of checking grip strength though it is one of the essential outcome measures and was used in all the studies that were included in this review. Furthermore, due to the scarcity of data from the studies, it may be difficult to recommend wrist manipulation to increase ROM or functional outcome.

Practical implication

In this review, all 4 studies used the same technique of wrist manipulation and showed a significant effect on pain in all except one,[26] in which it was used only for 15 days. When symptoms of LE persist, pain, and tissue pathology could lead to long-term disability,[3] and pain must be treated effectively to facilitate functionality. The symptoms were present for 6 weeks in all the studies included in this review. Considering the duration of the condition, giving wrist manipulation for at least 3 weeks gives meaningful results in pain relief. Though cost analysis was not the objective of this review, since two-thirds of all the subjects included in this review experienced a decrease in pain, wrist manipulation may be considered the method of treatment based on the therapist's skill compared to other physiotherapy treatment options like electrotherapeutic modalities, which involve procurement and maintenance cost.

Limitations

In this review, since we included studies with a score of 4 on PEDro, which were of moderate-quality evidence, and thus there is a risk of introducing study selection bias.[39] In addition, in the

Table 3
Summary of the intervention, outcome measures, and results

Author and year	Level of evidence	Experimental Group / A	Control Group/B	Group C	Outcome Measures	Results
Struijs, et al[19] (2003)	2b	Wrist manipulation Manipulative maneuver thrust technique to the scaphoid with the palmar side down 15 repetitions 20 sets 15-20 minutes session two times/week maximum nine sessions for 6 weeks.	• Pulsed ultrasound seven and half a minute, duty cycle 20%, Intensity 2Watt/cm^2 • Friction massage for ten minutes • Muscle strengthening and stretching exercises as a home program three sessions first week 2 sessions second week 1 session/week for 4 weeks total 9 for 6 weeks.	NA	• A global measure of improvement scale • Pain - NPRS • Pain-free grip force - Jamar hand dynamometer • Maximum grip strength - Jamar hand dynamometer • Pressure pain at lateral epicondyle - Pressure threshold meter • Wrist Flexion, extension - Goniometer. *Measured at* Baseline, 3 weeks, and 6 weeks.	• At three weeks, global improvement was significantly better in the manual therapy group, but no difference in pain. At 6 weeks, the pain was significantly better in group 1 (4.4 ± 1.5), and no difference in ROM. or Grp Strength
Joshi et al. [20] (2013)	2b	• Wrist manipulation - Scaphoid thrust ten repetitions, 15-20 minutes, 2 sessions/ week, maximum 5 sessions for three weeks.	• Pulsed US – two Watt/cm^2 for seven min • Friction massage - for ten minutes. • After the pain subsides, Stretching given 2 times/day for 5 sessions in 3 weeks.	NA	• Pain - VAS • Pain-Free grip strength - Hand dynamometer • Maximum grip strength - Hand dynamometer • ROM - Goniometer **Measured at** Baseline After three weeks.	After three weeks of treatment, patients who received wrist manipulation displayed significant improvements in NPRS scores of 5.2 (+ 2.4) in Group 1 instead of 3.2 (+ 2.1) in Group 2.
Sharma et al[25] (2020)	2b	• LLLT– (pulse mode) wavelength 904 nm, mean energy output-12 MW, peak value- 8.3W, and frequency- 70 Hz three sessions /week for 4 weeks. • Flexibility and endurance training.	• Wrist manipulation technique to the scaphoid with the palmar side down, 15 repetitions, done twice, 15-20 minutes session, 3 times/week for four weeks. (12 sessions) • LLLT 3 sessions /week for 4 weeks• Flexibility and endurance training for 4 days for 3 weeks.	NA	• Pain - NPRS • Grip strength - Hand dynamometer **Measured at** Baseline After four weeks.	• The overall success rate of pain patients was higher in the groups that received wrist manipulation than conventional treatment pain – mean and SD being 3.6 ± 1.05. • Grip strength- 19.80 ± 1.08.
Manchanda et [26] (2008)	2b	• Mulligan MWM for elbow 10 repetitions three sets • Pulsed US 20% duty cycle, 3MHz, 1.2 Watt/cm^2 for five minutes. • Stretching 10 repetitions • Progressive resisted exercises 15 sessions for 2 weeks.	• Wrist manipulation ten repetitions three sets total of 15 sessions • Pulsed US 20% duty cycle, 3MHz, 1.2 Watt/cm^2 for five minutes. • Stretching 10 repetitions. • Progressive resisted exercises 15 sessions for 2 weeks.	• Pulsed US at 20% duty cycle, 3MHz, 1.2Watt/cm^2 for five minutes. • Stretching ten repetitions • Progressive resisted exercises 15 sessions for 2 weeks.	• Pain - VAS • Functional pain scale for tennis elbow • Grip strength **Measured at** Baseline Day 5 Day 10 Day 15.	• Pain did not show any improvement. • Strength improved in both manipulation groups. • Mean Grip strength (1) 0.1 and Grip strength (2) 0.15.

Note: Level of Evidence- Oxford Centre for Evidence-Based Medicine.
NPRS = numerical pain rating scale; cm = centimeter, SD = standard deviation; VAS = Visual Analogue Scale; LLLT = low-level laser therapy; US = ultrasound; MHz = megahertz; Hz = Hertz; MWM = movement with mobilization; ROM = range of motion; nm = nanometre; MW = megawatt.

included studies, the comparison group had different modalities as the treatment option. The exclusion criteria were not well defined to rule out other causes of lateral elbow pain. Probably a treatment-based classification is required to see the best effect of mobilizations on LE. In all the included studies, the inclusion criteria were only the duration of the symptoms, and there was variability in the age of the population included; in one study, age was not mentioned. In addition, the pain intensity in the studies refers to time points with increased heterogeneity and is poorly reported. Another limitation was that the study results showed an effect on pain only in the short-term duration. Further, the chronicity of LE was also variable.

Conclusion

The review demonstrates the fair-quality evidence on the short-term effect of the wrist manipulation technique on pain in LE. There is a convincing evidence that joint manipulations targeted at the wrist improve pain when given for a minimum of 3 weeks compared to the management of LE in control groups. No conclusion could be drawn about grip strength as the results varied in different studies. Besides, the method and type of grip strength measurement were inconsistent in the studies included. Early evidence advocates that wrist joint manipulations may be beneficial in reducing pain in LE treatment. There is a need to use

standardized outcome measures to evaluate wrist mobilization's effects on the functional outcomes when treating LE.

Acknowledgment

None.

References

1. Verhaar JAN. Tennis elbow. *Int Orthop*. 1994;18:263–267.
2. Fredberg U, Stengaard-Pedersen K. Chronic tendinopathy tissue pathology, pain mechanisms, and etiology with a special focus on inflammation. *Scand J Med Sci Sports*.. 2008;18:3–15.
3. Coombes BK, Bisset L, Brooks P, Khan A, Vicenzino B. Effect of corticosteroid injection, physiotherapy, or both on clinical outcomes in patients with unilateral lateral epicondylalgia: a randomized controlled trial. *Jama*. 2013;309(5):461–469.
4. Taylor SA, Hannafin JA. Evaluation and management of elbow tendinopathy. *Sports Health*. 2012;4(5):384–393.
5. Shiri R, Viikari-Juntura E, Varonen H, Heliövaara M. Prevalence and determinants of lateral and medial epicondylitis: a population study. *American J epidemiol*. 2006;164(11):1065–1074.
6. Walker-Bone K, Palmer KT, Reading I, Coggon D, Cooper C. Prevalence and impact of musculoskeletal disorders of the upper limb in the general population. *Arthritis Care & Res*. 2004;51(4):642–651.
7. Allander E. Prevalence, incidence, and remission rates of some common rheumatic diseases or syndromes. *Scand J Rheumatol*. 1974;3(3):145–153.
8. Leclerc A, Landre MF, Chastang JF, Niedhammer , Roquelaure Y. Work SG on R. Upper-limb disorders in repetitive work. *Scand J Work Environ Health*.. 2001;27(4):268–278.
9. Hume PA, Reid D, Edwards T. Epicondylar injury in sport. *Sports Med*. 2006;36(2):151–170.
10. Sanders Jr TL, Maradit Kremers H, Bryan AJ, Ransom JE, Smith J, Morrey BF. The epidemiology and health care burden of tennis elbow: a population-based study. *Am J Sports Med*. 2015;43(5):1066–1071.
11. Smidt N, Lewis M, VAN DER Windt DAWM, Hay EM, Bouter LM, Croft P. Lateral epicondylitis in general practice: course and prognostic indicators of outcome. *J Rheumatol*. 2006;33(10):2053–2059.
12. Vicenzino B, Wright A. Lateral epicondylalgia I: epidemiology, pathophysiology, etiology and natural history. *Physical Therapy Rev*. 1996;1(1):23–34.
13. Bisset LM, Vicenzino B. Physiotherapy management of lateral epicondylalgia. *J Physiother*. 2015;61(4):174–181.
14. Kim YJ, Wood SM, Yoon AP, Howard JC, Yang LY, Chung KC. Efficacy of nonoperative treatments for lateral epicondylitis: a systematic review and meta-analysis. *Plast Reconstr Surg*. 2021;147(1):112–125.
15. Dion S, Wong JJ, Côté P, et al. Are passive physical modalities effective for the management of common soft tissue injuries of the elbow?: a systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration. *Clin J Pain*. 2017;33(1):71–86.
16. Thomas E, Cavallaro AR, Mani D, Bianco A, Palma A. The efficacy of muscle energy techniques in symptomatic and asymptomatic subjects: a systematic review. *Chiropr Man Therap*. 2019;27:35.
17. Piper S, Shearer HM, Côté P, et al. The effectiveness of soft-tissue therapy for the management of musculoskeletal disorders and injuries of the upper and lower extremities: a systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) collaboration. *Man Ther*. 2016;21:18–34.
18. Lucado AM, Dale RB, Vincent J, Day JM. Do joint mobilizations assist in the recovery of lateral elbow tendinopathy? A systematic review and meta-analysis. *J Hand Ther*. 2019;32(2):262–276 e1.
19. Struijs PAA, Damen PJ, Bakker EWP, Blankevoort L, Assendelft WJJ, van Dijk CN. Manipulation of the wrist for management of lateral epicondylitis: a randomized pilot study. *Phys Ther*. 2003;83(7):608–616.
20. Joshi S, Metgud S, C E. Comparing the effects of manipulation of wrist and ultrasound, friction massage and exercises on lateral epicondylitis: a randomized clinical study. *Indian J Physiotherapy and Occup Ther - An International J*. 2013;7:205.
21. Cashin AG, McAuley JH. Clinimetrics: Physiotherapy Evidence Database (PEDro) Scale. *J Physiother*. 2020;66(1):59.
22. Matos AP, Pegorari MS. How to classify clinical trials using the PEDro scale? *J Lasers Med Sci*. 2020;11(1):1–2.
23. Maher CG, Sherrington C, Herbert RD, Moseley AM, Elkins M. Reliability of the PEDro scale for rating quality of randomized controlled trials. *Phys Ther*. 2003;83(8):713–721.
24. Yamato TP, Maher C, Koes B, Moseley A. The PEDro scale had acceptably high convergent validity, construct validity, and interrater reliability in evaluating methodological quality of pharmaceutical trials. *J Clin Epidemiol*. 2017;86:176–181.
25. Sharma1 S, Kumar1 P, Chaudhuri2 P, Malhotra3 N, Narula4 H, Chahal5 A. Is wrist manipulation and low-level laser therapy collectively beneficial for patients with lateral epicondylitis? *Indian J Public Health*. 2020;11(5):489–495.
26. Manchanda G, Grover D. Effectiveness of movement with mobilization compared with manipulation of wrist in case of lateral epicondylitis. *Indian J Physiother Occup Ther*. 2008;2:16–25.
27. Pal T, Basak T. Comparative efficacy of wrist manipulation. *Progressive Exercises and Both Treatments in Patients with Tennis Elbow*. 2018;8:87.
28. Patel N. Effectiveness of mobilization with movement of elbow compared with manipulation of wrist in patients of lateral epicondylitis. *International J Physiotherapy Res*. 2013;1(4):177–182.
29. Goyal M, Kumar A, Monga M, Moitra M. Effect of wrist manipulation & cyriax physiotherapy training on pain & grip strength in lateral epicondylitis patients. *J Exercise Sci Physiotherapy*. 2013;9(1):17.
30. Lewit K. Manuelle Medizin: Im Rahmen der Medizinischen Rehabilitation. Leipzig, Germany: Auflage Johan Ambrosius Barth; 1977.
31. Heiser R, O'Brien VH, Schwartz DA. The use of joint mobilization to improve clinical outcomes in hand therapy: a systematic review of the literature. *J Hand Ther*. 2013;26(4):297–311.
32. Bialosky JE, Beneciuk JM, Bishop MD, et al. Unraveling the Mechanisms of manual therapy: modeling an approach. *J Orthop Sports Phys Ther*. 2018;48(1):8–18.
33. Jun P, Pagé I, Vette A, Kawchuk G. Potential mechanisms for lumbar spinal stiffness change following spinal manipulative therapy: a scoping review. *Chiropractic & Manual Ther*. 2020;28(1):15.
34. Skirven TM, Osterman AL, Fedorczyk J, Amadio PC. Rehabilitation of the Hand and Upper Extremity, 2-Volume Set E-Book: Expert Consult. St. Louis: Elsevier Health Sciences; 2011.
35. Stratford PW, Levy DR. Assessing valid change over time in patients with lateral epicondylitis at the elbow. *Clin J Sport Med*. 1994;4(2):88–91.
36. Lim ECW. Pain free grip strength test. *J Physiother*. 2013;59(1):59.
37. Dorf ER, Chhabra AB, Golish SR, McGinty JL, Pannunzio ME. Effect of elbow position on grip strength in the evaluation of lateral epicondylitis. *J Hand Surg Am*. 2007;32(6):882–886.
38. De Smet L, Van Ransbeeck H, Fabry G. Grip strength in tennis elbow : long-term results of operative treatment. *Acta Orthop Belg*. 1998;64(2):167–169.
39. Moher D, Pham B, Jones A, et al. Does quality of reports of randomised trials affect estimates of intervention efficacy reported in meta-analyses? *Lancet*. 1998;352(9128):609–613.

JHT Read for Credit
Quiz: # 991

Record your answers on the Return Answer Form found on the tear-out coupon at the back of this issue or to complete online and use a credit card, go to *JHTReadforCredit.com*. There is only one best answer for each question.

1. The study design is
   a. RCTs
   b. systematic review
   c. case series
   d. qualitative

2. How many articles met the inclusionary criteria
   a. 1
   b. 2
   c. 3
   d. 4

3. To limit their search to only certain types of studies, the authors employed the
   a. Stanford criterion
   b. critical mass theory
   c. RCT filter
   d. ASHT standards

4. The mobilization technique described included
   a. lunate mobilization of the flexed wrist
   b. scaphoid mobilization of the extended wrist
   c. capitate mobilization of the neutral wrist
   d. combined scaphoid, lunate, capitate mobilization of the neutral wrist

5. The authors concluded that the literature suggests that wrist manipulation helps mitigate the pain of lateral epicondylitis in the short term
   a. true
   b. false

When submitting to the HTCC for re-certification, please batch your JHT RFC certificates in groups of 3 or more to get full credit.