Section: Orthopedics

Systematic Review

COMPARATIVE EFFECTIVENESS OF DRY NEEDLING WITH CORTICOSTEROID IN THE TREATMENT OF LATERAL EPICONDYLITIS: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Lateral epicondylitis is a common overuse injury causing lateral elbow pain, diagnosed clinically by tenderness and pain on resisted wrist extension. Multiple conservative and invasive treatments exist, but none show definitive superiority. Corticosteroid injections and dry needling are commonly used, yet evidence for their comparative effectiveness remains inconclusive. This systematic review aims to compare dry needling and corticosteroid injections for pain and disability outcomes in lateral epicondylitis.

Materials and Methods: Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines extension for scoping reviews was followed for designing and reporting this systematic literature review.

Results: The systematic literature search identified 894 publications across multiple keyword combinations related to dry needling and corticosteroid treatment for lateral epicondylitis and elbow tendinopathy. After removal of duplicate records, 305 articles were screened for relevance. Application of predefined inclusion and exclusion criteria resulted in the selection of three eligible studies, which were ultimately included in the final systematic review for qualitative analysis.

Conclusion: Both dry needling and corticosteroid injections improve lateral epicondylitis symptoms in the short and medium term. Dry needling shows superior long-term functional outcomes with fewer adverse effects, though larger high-quality trials are needed to confirm these findings.

Keywords: Lateral epicondylitis; Dry needling; Corticosteroid injection; Tennis elbow; Pain management; Functional outcome.

INTRODUCTION

Lateral epicondylitis (LE) or tennis elbow is an overload injury following minor and unrecognized trauma involving the extensor muscles of the forearm.[1] It has a point prevalence ranging from 1% to 3% in the general population and is a common cause of pain in the lateral aspect of the elbow. It has a high incidence rate among professionals with occupational tasks that require repetitive, resistance-based hand and wrist movements, and overhead activities.[2] The diagnosis of LE is based on pain provoked by palpation over the lateral epicondyle of the humerus and the extensor carpi radialis brevis tendon during resisted dorsiflexion of the wrist by specific manual tests.[3]

Many treatment options have been recommended for LE, but none of them have proven to be effective.[4] The first line of treatment includes the use of topical and oral nonsteroidal anti-inflammatory drugs, bracing, and ice application. These have proven to decrease pain but show less evidence in accelerating the healing process.[5] The second line of treatment includes invasive extracorporeal shock-wave therapy,[6] ozone treatment,[7] prolotherapy,[8] and platelet-rich plasma injections,[9] or saline.[10] These

techniques have less evidence and are moderately effective.[11] Dry needling (DN) and corticosteroid injections (CSI) have also been used to treat LE.[12,13] The anti-inflammatory effects of CSI relieve pain and diminish disability.[14] However, a systematic review concluded that the existing evidence on the effectiveness of CSI for LE was inconclusive.[15] DN is a procedure used to treat myofascial trigger points. A local twitch response is evoked by DN that interrupts the motor end-plate noise, inducing an analgesic effect by reducing spontaneous activity and enhancing oxygenation of the tissue by increasing local vascularization. It may also boost the release of opioids and beta-endorphins that control pain transmission.[16] However, support for the use of DN in patients with LE in the literature is insufficient, and the method of DN is controversial.[17,18] It is unclear if one intervention is superior to the other for pain and disability outcomes, and the effect of these interventions at different time points is insufficiently investigated.[19] Thus, in this systematic review, we aimed to critically analyze the literature to compare the effectiveness of DN with CS for the treatment of LE.

MATERIALS AND METHODS

Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines extension for scoping reviews (20) was followed for designing and reporting this systematic literature review.

Data sources and searches

We searched PubMed, PEDro, and Cochrane Central Register of Controlled Trials until 12 November 2023 using the keywords "elbow tendinopathy", "tennis elbow", "lateral epicondylitis", "dry needling", and "corticosteroids". The search strategy was intervention and condition following the Cochrane Handbook for Systematic Reviews of Interventions.[21] Grey literature was searched on the Clinical Trial Registry of India, clinicaltrials.gov, Google Scholar, and a reference list of eligible articles.

Inclusion and Exclusion

The inclusion criteria for selecting the study were (1) studies including an adult population (>18 years old) diagnosed with LE, (2) studies in which one group received the dry needling intervention, (3) acceptable comparator with corticosteroids, (4) studies with the primary outcome as pain intensity (e.g. as measured with a Visual Analog scale or a numerical pain rate scale) or related disability (e.g. as assessed with a specific-disease questionnaire), and (5) studies categorized under randomized controlled trial.

We excluded unpublished articles, duplicate publications, reviews, editorials, case reports, letters, meta-analyses, protocols, studies in languages other than English, and studies not reporting the required data.

Quality assessment

Quality assessment of each included study was done through the PEDro Scale.[22] The scale has 11 items, for which the answer is either "Yes" or "No." If the item was present in the study, then it was awarded as "1" and "0" if not present. We preferred the PEDro Scale because it is comprehensive and widely accepted for an exhaustive assessment of data quality. We rated the general quality of included studies nearly as poor, fair, good, or excellent" on the PEDro scale if the score was <4, 4–5, 6–8, or more than 9, respectively.

Data extraction

Data was inputted into a standardized data extraction table (Excel) and was independently checked by a second reviewer for accuracy. The following variables were extracted: name of the first author, year of publication, study design, participants, mean age, intervention, outcome measures and time points, and result.

RESULTS

Search Results

The systematic search yielded a total of 894 publications. Out of 894 studies, 186 studies were found using the keywords "dry needling AND lateral epicondylitis", 383 studies with keywords "corticosteroids AND lateral epicondylitis", 76 studies with the keywords "dry needling AND elbow tendinopathy", 93 studies with keywords "corticosteroids AND elbow tendinopathy", 67 studies with keywords "dry needling AND tennis elbow", 89 studies with keywords "corticosteroids AND tennis elbow". One study was found from the other source. After removing duplicates, 305 articles were found to be potential publications for screening. After the application of pre-defined inclusion and exclusion criteria, a total of three studies were included in the systematic review [Figure 1].

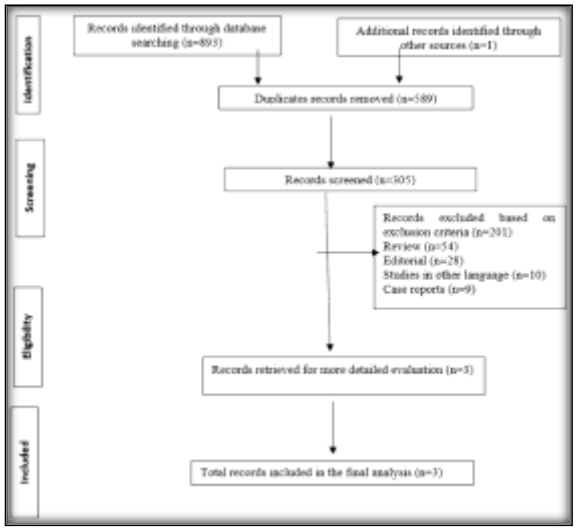

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Figure 1: PRISMA Flow diagram of study selection

Study characteristics

All three studies included males and females with lateral epicondylitis (23), (24), (25). The subjects were divided into dry needling and corticosteroid groups respectively. The included studies involved 203 subjects with 100 subjects enrolled in the DN group and 103 in the CS group. One study did not report data on the sex of the participants (23). No conflict of interest was reported. The baseline characteristics of the subjects included in these studies are provided in [Table 1].

Table 1: Baseline Characteristics

First Author	Year	Study Design	Participants	Mean Age	Intervention Groups	Outcome Measures & Follow-up	Results
Uygur et al.	2020	Randomized Controlled Trial	DN: 49CSI: 52	DN: 47.5 ± 7.3 yrsCSI: 48.1 ± 10.3 yrs	Group 1: DNGroup 2: CSI	PRTEE scores measured before intervention, at day 20, and at 6 months	Patient improvement:Day 20: DN 15.6 ± 7.7 vs CSI 36.0 ± 14.7; p < 0.01 6 months: DN 9.7 ± 7.6 vs CSI 19.3 ± 19.4; p < 0.01
Güngör & Güngör	2021	Randomized Controlled Trial	DN: 24CSI: 24	DN: 46 ± 7.4 yrsCSI: 40.9 ± 7.7 yrs	Group 1: DNGroup 2: CSI	VAS for pain & DASH for function measured before treatment, at 3 weeks, and at 3 months	Pain (VAS):3 weeks: DN 2.3 ± 0.6 vs CSI 2.3 ± 0.6; p = 0.98 3 months: DN 1.1 ± 0.5 vs CSI 0.7 ± 0.6; p = 0.01 Function (DASH):3 weeks: DN 31.6 ± 6.8 vs CSI 32.0 ± 5.0; p = 0.84 3 months: DN 30.0 ± 6.7 vs CSI 26.6 ± 3.2; p = 0.01
Nagarajan et al.	2022	Randomized Controlled Trial	DN: 27CSI: 27	DN: 43.96 ± 8.15 yrsCSI: 44.74 ± 8.33 yrs	Group 1: DNGroup 2: CSI	PRTEE scores measured before intervention, at week 4, and at week 8	Patient improvement: Week 4: DN 46.96 ± 4.43 vs CSI 49.19 ± 4.25; p < 0.001 Week 8: DN 38.04 ± 5.67 vs CSI 44.11 ± 3.45; p < 0.001

Abbreviations: DS: Dry needling; CSI: corticosteroids injection; PRTEE: Patient-Rated Tennis Elbow Evaluation; VAS: visual analog scale; DASH: Disabilities of the Arm, Shoulder, and Hand

Quality assessment

We assessed the quality of data in the included studies using the PEDro Scale.[22] The quality assessment of all three studies indicated good to excellent quality as the scores ranged from 8 to 9. All the studies clearly stated the research question or the objective, and the study population was clearly specified and defined. The detailed result of the quality assessment is provided in Supplementary file 1.

Interventions

Dry needling: For dry needling intervention, the technique parameters and the needle diameter were different across the studies.

Uygur et al,[23] inserted fifteen 0.25 x 25 mm stainless steel needles at the lateral epicondyle. These needles were rotated 3-4 times, held in place for 10 minutes, and were later withdrawn. DN was performed twice a week for five sessions.

Güngör and Güngör,[24] used a fine needle (23 gauge) which was withdrawn and advanced throughout the long axis of the tendon about 40-50 times for 2 minutes to pepper the tendon. DN was performed once a week for three sessions.

Nagarajan et al,[25] inserted 8-12 disposable filiform needles of size 25 mm at the lateral epicondyle, close to the site of maximum tenderness, for approximately 10-12 minutes. DN was performed twice a week for five sessions.

Corticosteroids: One single-dose application of corticosteroid injections was used in all the studies. Nagarajan et al used a single dose (2 mL) of triamcinolone acetate (40 mg/mL) injection, while Uygur et al and Güngör and Güngör used a single dose (2 mL) of methylprednisolone acetate (40 mg/mL) injection at the lateral epicondyle.

Outcome Measures: The primary outcome of the included studies was pain. Two studies,[23,25] used the Patient-Rated Tennis Elbow Evaluation (PRTEE)

tool at different time points. One study (24) assessed pain using Visual Analog Scale (VAS) and assessed disability using Disabilities of the Shoulder, Arm, and Hand (DASH) at 3 weeks and at 3 months, respectively.

All the studies assessed short-term effects. At 3 weeks, Güngör and Güngör,[24] found no difference between DN and CSI (DN 2.3 ± 0.6 vs CSI 2.3 ± 0.6), whereas a significant difference in favor of DN was found by Uygur et al,[23] at 20th-day follow-up (DN 15.7 ± 7.7 vs CSI 36.0 ± 14.7) and by Nagarajan et al (25) at 4 weeks follow-up (DN 46.96 ± 4.43 vs CSI 49.19 ± 4.25).

Two studies assessed medium-term effects (24,25). Nagarajan et al,[25] found a significant difference in favor of DN at 8 weeks follow-up (DN 38.04 ± 5.67 vs CSI 44.11 ± 3.45), whereas Güngör et al (24) found a significant difference in favor of CSI at 12 weeks follow-up (DN 1.16 ± 0.56 vs CSI 0.75 ± 0.6).

One study assessed long-term effects.[23] At 6 months follow-up, Uygur et al,[23] found a significant difference in favor of DN (DN 9.7 ± 7.6 vs CSI 19.3 ± 19.4).

Güngör and Güngör,[24] assessed disability at 3 weeks and found no between-group difference between DN and CSI (DN 31.6 ± 6.8 vs CSI 32.0 ± 5.0). CSI was found to be superior to DN at 3 months follow-up (DN 30.0 ± 6.7 vs CSI 26.6 ± 3.2).

DISCUSSION

Several studies have been conducted to treat LE with different treatment approaches. This study aimed to compare the effectiveness of DN treatment with CSI. Both CSI and DN are recommended to reduce pain and disability following distinct mechanisms. While DN effects are derived from the needling stimulation over the tissue, CSI effects are derived from the action of the drug being injected.[26] Some studies have found positive effects of CSI for common musculoskeletal conditions, while other studies have found no clinically relevant improvements in comparison to placebo injections.[27] An alternative option to the use of CSI is DN. Although its mechanisms are not fully understood, it has been suggested that a local twitch response provoked by DN may send neural inputs to the brain that would help to break the vicious cycle of pain-spasm pain.[28]

At short-term follow-up, our results indicate no significant difference between DN and CSI for one study at 3 weeks.[24] This finding is interesting because clinical decision-making could consider other factors beyond the effect of interventions such as cost, adverse events, or patient preference. Other studies at ≤ 3 weeks,[23] and at 4 weeks,[25] follow-up respectively found effects in favor of DN for reducing pain when compared with CSI.

For medium-term follow-up, one study at 8 weeks follow-up,[25] found effects in favor of DN, while another study at 12 weeks follow-up,[24] found effects in favor of CSI for reducing pain.

One study found effects in favor of DN for reducing pain when compared with CSI at 6 months follow-up.[23] This is consistent with earlier research findings which assessed CSI treatment's efficacy. The outcomes of the extended follow-ups in the CSI treatment group indicated that its effects are diminishing.[8] Since most CSI injections are delivered by one single application, the placebo effect may reduce over time, whereas, DN intervention is generally performed in multiple treatment sessions, it is reasonable to hypothesize that DN would show better results than CSI at longer follow-up periods. Earlier trials have shown that CSI tends to present either similar or greater effects in the short-term than long-term for some comparators and no differences in the long-term.[19] CSI has shown skin atrophy, skin whitening, and delayed wound healing in long-term use.[29]

Only one study reported disability as an outcome. In the short-term, there was no difference between DN and CSI, while at 3 months follow-up, effects on disability were found in favor of CSI.[24] It is recommended to include disability as an outcome for future studies as musculoskeletal conditions are the leading cause of disability.

Minor adverse events have been reported following DN treatment sessions such as transient pain, localized soreness, and local hemorrhage, whereas major adverse events are rare (< 0.1%).[30] Following CS application, it has been observed that local inflammation may increase by up to three, along with adrenal suppression, and cartilage damage.[31] These findings suggest that CSI needs to be used with caution. When compared with CSI, DN is safe, low cost, low risk, less invasive, and easy to perform.[23] However, one downside of DN is that it is time-consuming. Participants require multiple sessions, while CSI requires one session.[32]

There are several limitations worth mentioning. First, only three studies were included in the review, which limits the comparisons, reduces the strength of the results, and weakens the generalization of the findings, and second, the limited sample size of the included studies.

CONCLUSION

To conclude, our findings suggest that both DN and CS treatments are effective and significantly improve the symptoms of LE during short-term and medium-term follow-ups. However, DN showed significantly better functional outcomes and minor adverse events in comparison to CSI during long-term use. To ensure that the superiority effect from DN in the long-term is derived from the intervention itself, large randomized-controlled trials with adequate power, extended follow-ups, and methodological quality are urgently needed for informed decision-making when choosing to use these interventions as adjunct therapies.

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