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A Comparison of Effectiveness of Dry Needling and Cross-Fiber Massage on Pain and Functional Mobility in Individuals with Chronic Lateral Epicondylitis

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ABSTRACT

Background: Lateral epicondylitis (LE), or tennis elbow, is a prevalent musculoskeletal condition characterized by lateral elbow pain and reduced function; primarily affecting adults aged 40–59. Although various conservative treatments exist, including dry needling (DN) and cross-fiber massage (CFM), limited evidence directly compares their effectiveness in chronic LE. **Objective**: To compare the effectiveness of DN and CFM on pain intensity, functional disability, and grip strength in individuals with chronic LE. **Methods**: A single-blind randomized clinical trial was conducted involving 60 participants aged 30–60 years diagnosed with chronic LE. Participants were randomly assigned to DN (n=30) or CFM (n=30) groups. Interventions were administered twice weekly for four weeks. Pain, disability, and grip strength were assessed using the Visual Analog Scale (VAS), Patient-Rated Tennis Elbow Evaluation (PRTEE), and a handheld dynamometer, respectively, at baseline and post-intervention. **Results**: Both groups showed significant within-group improvements in VAS, PRTEE, and grip strength scores ($p<0.05$). Between-group comparison revealed that the CFM group had significantly lower post-treatment VAS scores ($p=0.007$), while no statistically significant differences were observed between groups for PRTEE ($p=0.55$) or grip strength ($p=0.819$). **Conclusion**: Both DN and CFM are effective in managing chronic LE. However, CFM provided superior pain reduction, likely due to its mechanical effects on fibrotic tendon tissue. Clinicians should consider patient-specific factors when selecting between these interventions. Further studies with long-term follow-up and imaging-based evaluation are recommended.

INTRODUCTION

Lateral epicondylitis (LE), commonly known as tennis elbow, is a painful condition caused by overuse of the forearm muscles, leading to inflammation or degeneration of the common extensor tendon attached to the lateral epicondyle of the humerus, resulting in pain and reduced grip strength.(1) LE affects 1–3% of the population; mainly adults aged 40–59, with higher prevalence in women.(2) A study in Lahore found a 39.33% prevalence of LE among housewives, with pain predominantly reported in the right arm.(3) Risk factors include forceful activity, poor posture, obesity, and smoking. Patients report lateral elbow pain worsened by gripping or lifting.(4) This pathological condition is regarded as a tendinopathy characterized by angiofibroblastic hyperplasia rather than classic inflammation. The condition results from repetitive microtrauma to the extensor carpi radialis brevis tendon, leading to collagen disorganization, neovascularization, and failed tendon healing response. Histopathological studies reveal fibroblast proliferation, increased ground substance, and absence of inflammatory cells, indicating a degenerative rather than inflammatory pathology(5) LE is typically managed with conservative treatments aimed at reducing pain and restoring function. Initial therapies include rest, activity modification, and non-steroidal anti-inflammatory drugs (NSAIDs) to relieve symptoms. Bracing or forearm straps may reduce stress on the extensor tendons, while therapeutic ultrasound and cryotherapy are often used in physical therapy settings. Stretching and strengthening exercises, particularly eccentric loading, are essential for tendon recovery (4) (6) In past few years, manual therapy techniques such as

cross-fiber friction massage and mobilization with movement have shown promise in reducing pain and improving grip strength. Additionally, dry needling and acupuncture are gaining support as effective interventions by targeting trigger points and promoting local healing responses.(7)

Dry Needling (DN) involves inserting fine, solid filiform needles into myofascial trigger points—hyperirritable spots within taut bands of skeletal muscle. This technique deactivates these trigger points, eliciting local twitch responses that disrupt the pain cycle. DN modulates both peripheral and central sensitization by reducing nociceptive input and altering biochemical mediators associated with pain, such as substance P and calcitonin gene-related peptide.(8) Clinical studies have demonstrated that DN can significantly reduce pain intensity and improve range of motion in various musculoskeletal conditions, including chronic neck pain and tension-type headaches.(9)

Cross-Fiber Massage (CFM), also called transverse friction massage, applies pressure perpendicular to muscle or tendon fibers. This technique breaks down adhesions, promotes collagen realignment, and increases local circulation, thereby enhancing tissue healing and reducing fibrosis.(10) CFM stimulates mechanoreceptors, which can alter pain perception and improve tissue extensibility.(11)

While DN and CFM have independently demonstrated therapeutic value in managing chronic musculoskeletal disorders, particularly tendinopathies, there is a remarkable absence of comparative studies evaluating their relative effectiveness in chronic lateral epicondylitis. Most available research addresses their individual outcomes, but head-to-head trials are rare, especially those focusing on long-standing cases where tendon degeneration predominates. This gap draws attention toward the need for empirical evidence comparing DN and CFM in terms of pain relief and restoration of functional mobility. Evaluating these techniques in a controlled setting is clinically relevant, as it may guide evidence-based decision-making for conservative care. This study employs validated outcome measures such as the Visual Analog Scale (VAS) for pain, the Patient-Rated Tennis Elbow Evaluation (PRTEE) for disability, and grip strength assessments to objectively quantify functional improvements. The aim is to determine which intervention is more effective in reducing symptoms and enhancing function in individuals with chronic LE.

METHODOLOGY

The study was randomized clinical trial (RCT). The study was conducted from 15 January 2025 to 20 May 2025 in accordance with the Declaration of Helsinki and was approved by the Institutional Ethics Review Board (IRB) of Government College University Faisalabad with reference no. GCUF/ERC/25/2474.

A total of 60 participants (30 in each group) (12) aged between 30 and 60 years with a clinical diagnosis of chronic LE (>6 weeks duration) (13) were recruited from outpatient physiotherapy departments of Chiniot hospital Faisalabad and Ahmad Poly clinic. Diagnosis was based on localized lateral elbow pain aggravated by resisted wrist extension or gripping activities, and a positive Cozen's or Mill's test with sensitivity 53% and specificity 100%.(14) Patient were included with age between 30-60 years, all genders, VAS≥4 and PRTEE≥45(15). Participants were excluded if they had prior elbow surgery or corticosteroid injection within the last three months, systemic musculoskeletal disorders such as rheumatoid arthritis, neurological deficits in the upper limb, or local skin infection or hypersensitivity at the treatment site (16) (4). Participants were randomly assigned to either the DN or CFM group using a computer-generated randomization schedule (block size = 4). Allocation was concealed using sealed opaque envelopes. The outcome assessor was blinded to the group assignment. Data were analyzed using SPSS version 25.0. Normality was tested with the Shapiro-Wilk test. Between-group comparisons were made using independent t-tests (for normally distributed data) or Mann-Whitney U tests (for non-parametric data). Within-group changes were analyzed using paired t-tests or Wilcoxon signed-rank tests. A p-value < 0.05 was considered statistically significant.

Intervention Protocols

Group A

DN was performed by a certified physiotherapist using sterile, single-use filiform needles. Trigger points in the extensor carpi radialis brevis and associated forearm muscles were targeted. Needle insertion was performed until a local twitch response was observed. Needles were retained for 10 minutes. Treatment was provided twice a week for 4 weeks (17)

Group B

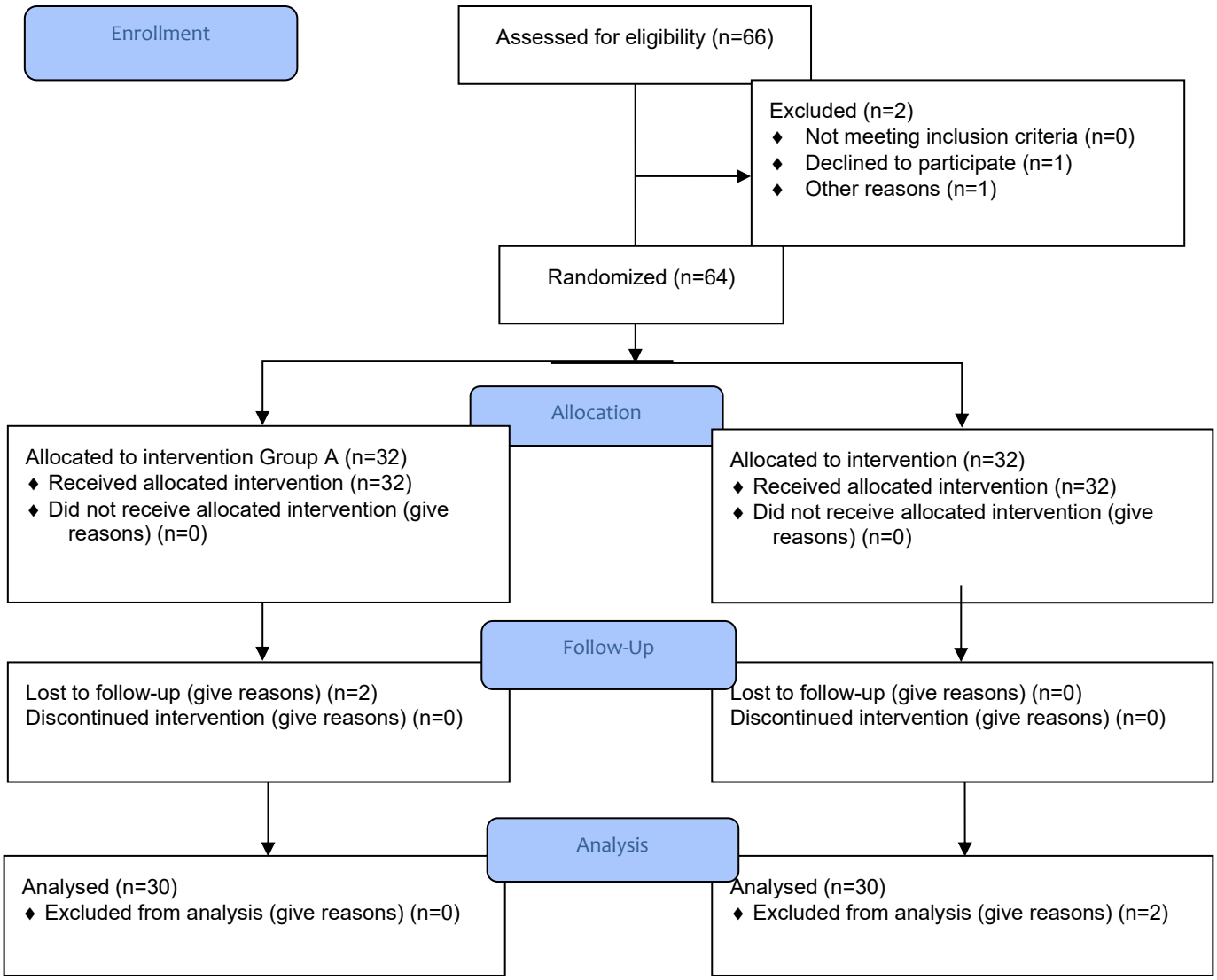
CFM was administered using moderate pressure perpendicular to the extensor tendon fibers for 10–15 minutes per session. Treatment was performed twice a week for 4 weeks (8 sessions), focusing on the lateral epicondyle and adjacent musculotendinous structures.(18)

Outcome Measures

Assessments were performed at baseline (Week 0) and post-intervention (Week 4).

- **Pain**
  Measured using the Visual Analog Scale (VAS) (0–10 cm scale).
- **Functional Disability**
  Evaluated using the Patient-Rated Tennis Elbow Evaluation (PRTEE) questionnaire.

CONSORT Flow Diagram



RESULTS

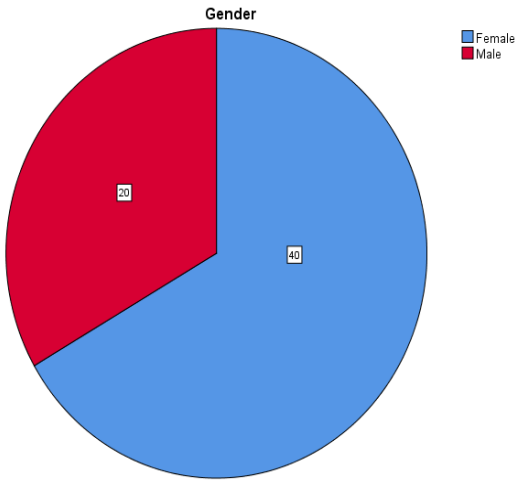
Table 1

Descriptive Statistics for Age

Variable	N	Mean	SD	Minimum	Maximum
Age in years	60	46.90	8.97	30	60

Figure 1

Pie Chart of Gender Distribution



The mean age of the 60 participants is 46.9 years with a standard deviation of 8.97 years and the pie chart showing the gender distribution: 40 females and 20 males.

Table 2

Within Group's Comparison of All Characteristics of Both Groups

Characteristics	Group A (Dry Needling)			Group B (Cross Fiber Massage)		
	Mean	SD	P-value	Mean	SD	P-value
VAS Baseline	6.10	1.398	0.000	6.00	1.364	.000
VAS Post	4.60	1.476		3.56	1.406	
PRTEE Baseline	64.90	11.272	0.000	65.50	10.643	.000
PRTEE Post	43.33	15.318		42.70	11.117	
Grip Strength Baseline	16.95	4.203	0.000	16.65	4.512	.000
Grip Strength Post	21.43	4.396		21.55	4.907	

Within groups paired t test showed improvements in both groups across all outcomes. In Group A, VAS reduced from 6.10 ± 1.40 to 4.60 ± 1.48, PRTEE from 64.90 ± 11.27 to 43.33 ± 15.32, and grip strength increased from 16.95 ± 4.20 to 21.43 ± 4.40. Similarly, in Group B, VAS

reduced from 6.00 ± 1.36 to 3.56 ± 1.41, PRTEE from 65.50 ± 10.64 to 42.70 ± 11.12, and grip strength improved from 16.65 ± 4.51 to 21.55 ± 4.91.

Table 3
Between Groups' Comparison in All Characteristics

Outcomes	Groups	Mean	SD	P-value
VAS Post	Dry Needling	4.6000	1.47625	0.007
	Cross Fiber Massage	3.5667	1.40647	
PRTEE Post	Dry Needling	43.3333	15.31808	0.55
	Cross Fiber Massage	42.7000	11.11740	
Grip Strength Post	Dry Needling	21.4367	4.39643	0.819
	Cross Fiber Massage	21.1600	4.90760	

Post-treatment VAS was significantly lower in the Cross Fiber Massage group (3.57 ± 1.41) than in the Dry Needling group (4.60 ± 1.48), with p = 0.007. PRTEE scores were similar between groups (43.33 ± 15.32 vs. 42.70 ± 11.12), showing no significant difference (p = 0.55).

DISCUSSION

The present randomized clinical trial aimed to compare the effectiveness of DN and Cross- CFM on pain reduction and functional improvement in patients with chronic LE. The findings indicate that both interventions led to significant within-group improvements across pain, function mobility and grip strength. However, between-group comparisons showed a statistically significant greater reduction in post-treatment VAS scores in the CFM group, while PRTEE and grip strength outcomes were statistically non-significant between the two interventions.

Our results align with previous research suggesting the effectiveness of DN in reducing musculoskeletal pain through neurophysiological mechanisms. DN is believed to deactivate myofascial trigger points and reduce nociceptive input via spinal segmental inhibition, resulting in immediate analgesic effects (17) (19). It stimulates endogenous opioid release and normalizes the chemical milieu of the active trigger point, which may explain the observed within-group improvements in the DN group(20).

On the other hand, CFM, a form of manual therapy, likely alleviated symptoms by disrupting cross-linking adhesions and enhancing tissue perfusion. This promotes remodeling of collagen fibers and reduces fibrosis, as supported by recent literature (21). Mechanoreceptor stimulation during massage may have led to descending pain inhibition via the gate control mechanism, which could account for the significant pain relief observed(22).

Interestingly, although both interventions improved function and grip strength, there was no statistically significant difference between DN and CFM for PRTEE and grip strength post-treatment. This outcome corroborates with studies that propose comparable long-term effects of manual therapies and needling on functional recovery, particularly in chronic tendinopathies where tissue healing is prolonged (23).

Moreover, the observed greater reduction in pain scores in the CFM group challenges the often-presumed superior analgesic effects of DN. One plausible explanation could be the chronicity of LE in our participants. Chronic LE is characterized more by degenerative changes than by active myofascial trigger points (24). CFM, by directly influencing the tendon matrix and promoting collagen realignment, might therefore be better suited to address such degenerative changes than DN, which primarily targets neuromuscular trigger points.

Age and gender distribution in our sample (mean age ~46.9 years; female predominance) reflect known epidemiological trends of LE (3, 4). Hormonal and biomechanical factors, including repetitive arm movements in domestic or occupational tasks, are more common in females and may influence treatment responsiveness (25).

Importantly, while both treatments were safe and well-tolerated, the selection between DN and CFM should consider patient preferences, therapist expertise, and specific clinical presentation. For instance, DN may be more appropriate in the presence of active myofascial trigger points, whereas CFM may benefit those with tendon thickening or fibrotic changes without significant muscular involvement.

The results of our study contribute valuable comparative evidence to a currently limited body of literature. Few head-to-head RCTs exist evaluating DN vs. CFM in chronic LE. One such study by Cotchett et al. (2021) on plantar heel pain found no superiority of DN over manual therapy, mirroring our findings in upper limb tendinopathies.(26) This supports the notion that both approaches may have different mechanisms but ultimately yield comparable functional benefits in chronic cases.

Nonetheless, our findings should be interpreted in the context of certain limitations. The study did not include a long-term follow-up to assess sustained effects. Moreover, the absence of imaging (e.g., ultrasound or MRI) limits our ability to quantify structural tendon changes pre- and post-treatment. Future studies should incorporate these elements and consider the addition of a placebo or control group to better isolate treatment effects.

CONCLUSION

This randomized clinical trial demonstrated that both dry needling and cross-fiber massage are effective in improving pain, functional mobility and grip strength in individuals with chronic LE. Statistically significant within-group improvements were observed in both interventions and no significant differences were found between the two groups in functional disability or grip strength, suggesting that both modalities offer comparable benefits in terms of functional recovery. The superior pain reduction observed in the CFM group may be attributed to its mechanical effects on fibrotic tendon tissue, which are particularly relevant in chronic cases marked by tendinosis rather than acute inflammation. In contrast, DN may be more beneficial in cases where active myofascial trigger points are a predominant source of pain.

Clinicians may consider either intervention as part of conservative management for chronic LE, tailoring the choice to the patient's specific clinical presentation, underlying pathology, and treatment preferences. Further research with long-term follow-up and imaging-based

assessment is recommended to better understand the sustained effects and structural changes induced by these therapies.

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