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Effect of Rotator Cuff Strengthening Exercises Combined with Myofascial Release on Pain and Function in Patients with Tennis Elbow: A Single-Group Pre–Post Interventional Study

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Abstract

Background: Tennis elbow (lateral epicondylitis) is a common overuse tendinopathy of the extensor carpi radialis brevis (ECRB) that causes lateral elbow pain, reduced grip strength, and functional limitation. Conventional treatment directed at the forearm alone often produces incomplete or short-lived relief. Weakness of the rotator cuff and scapular stabilisers may alter upper-limb biomechanics and increase load on the forearm extensors, providing a rationale for combining proximal strengthening with local soft-tissue treatment.

Objective: To evaluate the effect of rotator cuff strengthening exercises combined with myofascial release on pain and function in patients with tennis elbow.

Materials and Methods: Twenty patients (10 male, 10 female; mean age 29.55 ± 3.53 years) with unilateral lateral epicondylitis of at least four weeks' duration and a positive Cozen's test were recruited from Narinder Mohan Hospital & Heart Centre, Ghaziabad, using convenience sampling. In this single-group pre–post design, all participants received rotator cuff and scapular strengthening using elastic resistance together with instrument-assisted myofascial release of the wrist extensors, three times per week for four weeks. Pain was assessed with the Visual Analogue Scale (VAS) and pain provoked on Cozen's test; function was assessed with the Patient-Rated Tennis Elbow Evaluation (PRTEE). Outcomes were recorded at baseline and after four weeks and compared using a paired t-test ($\alpha = 0.05$).

Results: All outcomes improved significantly from baseline to post-intervention. Mean VAS fell from 7.3 ± 1.14 to 2.8 ± 0.75, PRTEE from 61.55 ± 6.69 to 19.85 ± 6.28, and Cozen's test pain from 7.6 ± 1.1 to 2.8 ± 0.77 (all $p < 0.001$).

Conclusion: A four-week programme combining rotator cuff strengthening with myofascial release produced clinically and statistically significant reductions in pain and disability in patients with tennis elbow. Targeting proximal muscle weakness alongside local fascial restriction may offer a more comprehensive management strategy. Randomised controlled trials with a comparison group and longer follow-up are recommended.

Keywords: Lateral epicondylitis; Tennis elbow; Rotator cuff strengthening; Myofascial release; PRTEE; Physiotherapy.

1. Introduction

Tennis elbow, or lateral epicondylitis, is one of the most common musculoskeletal disorders of the elbow, affecting approximately 1–3% of the general population. It arises from repetitive microtrauma and overload of the wrist extensor muscles, most notably the extensor carpi radialis brevis (ECRB). Although historically regarded as an inflammatory condition, current histopathological evidence indicates that it is predominantly a degenerative process — tendinosis — characterised by disorganised collagen, increased ground substance, and neovascularisation with little inflammatory cell infiltrate. The condition is frequently encountered in racquet sports and in occupations involving repetitive gripping, lifting, and forearm rotation, such as carpentry, plumbing, and prolonged computer use, and is a leading cause of lateral elbow pain, absence from work, and reduced athletic performance.

Clinically, patients present with pain and tenderness over the lateral epicondyle that may radiate into the forearm, weakness of grip, and difficulty with everyday tasks such as turning a doorknob or lifting a cup. Diagnosis is largely clinical and is supported by provocative tests including Cozen's, Mill's, and Maudsley's tests; imaging is reserved for atypical or refractory cases.

Management is initially conservative and includes activity modification, non-steroidal anti-inflammatory drugs, bracing, corticosteroid injection, and physiotherapy incorporating stretching and eccentric strengthening of the wrist extensors. However, outcomes with treatment aimed solely at the forearm are frequently inconsistent and prone to recurrence, and although corticosteroid injection can provide short-term relief, it is associated with poorer long-term results. This has prompted growing interest in addressing factors beyond the local tendon.

Emerging evidence implicates weakness of the rotator cuff and scapular stabilisers in the development and persistence of tennis elbow. Because gripping and lifting depend on a coordinated upper-limb kinetic chain, weakness proximally can lead to compensatory overuse of the forearm extensors and increased load at the lateral epicondyle; reductions of up to 25–35% in shoulder strength have been reported in affected individuals. Strengthening the rotator cuff may therefore help redistribute load and reduce strain on the ECRB. In parallel, myofascial release (MFR) — a manual technique that addresses fascial restriction and improves tissue mobility — has been shown to reduce pain and improve function in musculoskeletal conditions and may relieve extensor muscle tightness in tennis elbow.

Despite this biomechanical plausibility, the combined effect of proximal rotator cuff strengthening and local myofascial release has been studied relatively little. The present study was therefore undertaken to evaluate whether a programme combining rotator cuff strengthening exercises with myofascial release reduces pain and improves function in patients with tennis elbow.

2. Materials and Methods

2.1 Study design and setting

This was a single-group pre–post (quasi-experimental) interventional study conducted in the Department of Physiotherapy, I.T.S Institute of Health & Allied Sciences, Muradnagar, Ghaziabad. Participants were recruited from Narinder Mohan Hospital & Heart Centre, Mohan Nagar, Ghaziabad. The intervention and assessments were carried out over a period of approximately five to six weeks.

2.2 Ethical considerations

Ethical approval was obtained from the Institutional Ethical Committee, I.T.S Institute of Health & Allied Sciences (Ref. No. IIEC/2023-25/PHYSIO/013). The nature and purpose of the study were explained to all participants, and written informed consent was obtained before enrolment.

2.3 Participants

Twenty participants aged 20–40 years were recruited using convenience sampling according to the criteria below.

Inclusion criteria: age 20–40 years; persistent unilateral lateral epicondylitis pain of at least four weeks' duration; tenderness localised around the lateral epicondyle; pain and swelling near the common extensor tendon insertion; and a positive Cozen's test (pain on resisted wrist extension with the elbow extended).

Exclusion criteria: use of immunosuppressants, corticosteroids, cyclosporine, antipsychotics, analgesics, or NSAIDs within the preceding two weeks; inflammatory rheumatic disease; previous elbow surgery; gout; known allergies; fibromyalgia; and diabetes mellitus.

2.4 Outcome measures

Pain intensity was assessed using the Visual Analogue Scale (VAS), a 0–10 scale on which 0 represents no pain and 10 the worst imaginable pain. Pain provoked on Cozen's test was graded on the same 0–10 scale. Function and disability were assessed using the Patient-Rated Tennis Elbow Evaluation (PRTEE), a validated, condition-specific questionnaire comprising pain and function subscales scored from 0 (no pain or disability) to 100 (worst pain and disability). All measures were recorded at baseline and after four weeks of intervention by the same assessor.

2.5 Intervention

All participants received rotator cuff and scapular strengthening exercises together with instrument-assisted myofascial release of the wrist extensors, three sessions per week for four weeks. The strengthening programme used elastic resistance (TheraBand / loop band) and emphasised scapular depression and stabilisation throughout each exercise. Myofascial release was delivered using an instrument-assisted soft-tissue mobilisation (IASTM) tool applied to the ECRB and the remaining wrist extensors. The complete protocol is summarised in Table 1.

Table 1. Combined rotator cuff strengthening and myofascial release protocol.

Exercise / technique	Position and instructions	Hold time	Dosage
A. Rotator cuff and scapular strengthening (elastic resistance)			
Resisted shoulder flexion	Standing; depress and fix the scapula, pull the band forward to 90° shoulder flexion	10 s	10 reps × 2 sets
Resisted scapular flexion (scaption)	Standing; depress the scapula, pull the band between flexion and abduction to ~120°	10 s	10 reps × 2 sets
Resisted shoulder abduction	Standing; depress and fix the scapula, abduct the shoulder to 90° against the band	10 s	10 reps × 2 sets

Exercise / technique	Position and instructions	Hold time	Dosage
Single-hand ball roll on wall	Shoulder at 90° flexion; palm on ball, roll around a fixed axis maintaining constant pressure	30 s	3 sets
External rotation with loop band	Sitting; loop band over wrists, forearm mid-prone, elbow tucked; externally rotate against the band	7–10 s	10 reps × 2 sets
B. Myofascial release — instrument-assisted soft-tissue mobilisation (IASTM)			
ECRB release	IASTM tool glided along the ECRB near the lateral epicondyle; sustained pressure on tender points	20–30 s per point	2–3 min
Other wrist extensors release	IASTM tool glided along the remaining wrist extensors; sustained pressure on tender points	20–30 s per point	2–3 min

Frequency: 3 sessions per week for 4 weeks. ECRB, extensor carpi radialis brevis; IASTM, instrument-assisted soft-tissue mobilisation.

2.6 Statistical analysis

Data were analysed using SPSS. Descriptive statistics (mean and standard deviation) were computed for participant characteristics and all outcomes. Baseline and post-intervention scores were compared using a paired t-test, with the level of statistical significance set at $p < 0.05$.

3. Results

Twenty participants (10 male and 10 female) with a mean age of 29.55 ± 3.53 years (range 22–35 years) completed the study; there were no dropouts. At baseline, participants demonstrated high levels of pain and functional disability. Following four weeks of intervention, all outcome measures improved significantly (Table 2).

Mean VAS pain decreased from 7.3 ± 1.14 to 2.8 ± 0.75, a mean reduction of 4.5 points ($p < 0.001$). PRTEE scores decreased from 61.55 ± 6.69 to 19.85 ± 6.28, a mean reduction of 41.7 points ($p < 0.001$), reflecting a substantial improvement in pain and function. Pain provoked on Cozen's test decreased from 7.6 ± 1.1 to 2.8 ± 0.77, a mean reduction of 4.8 points ($p < 0.001$). The reduction in standard deviations from baseline to post-intervention indicates a consistent response across participants.

Table 2. Baseline and post-intervention outcome measures (n = 20).

Outcome measure	Baseline (Mean ± SD)	Post-intervention (Mean ± SD)	Mean change	p-value
VAS – pain (0–10)	7.3 ± 1.14	2.8 ± 0.75	4.5	< 0.001
PRTEE (0–100)	61.55 ± 6.69	19.85 ± 6.28	41.7	< 0.001
Cozen's test pain (0–10)	7.6 ± 1.1	2.8 ± 0.77	4.8	< 0.001

VAS, Visual Analogue Scale; PRTEE, Patient-Rated Tennis Elbow Evaluation; SD, standard deviation.

4. Discussion

The principal finding of this study is that a four-week programme combining rotator cuff strengthening with myofascial release produced large, statistically significant improvements in pain and function in patients with tennis elbow, as reflected in the VAS, PRTEE, and Cozen's test scores. These results support the rationale that addressing proximal muscle weakness together with local soft-tissue restriction may be more effective than treatment directed at the forearm alone.

The pathophysiology of tennis elbow is now understood to be primarily degenerative rather than inflammatory. Repetitive microtrauma to the ECRB leads to collagen disorganisation, increased ground substance, and neovascularisation — the histological picture of tendinosis — which helps explain why purely anti-inflammatory strategies often provide only transient benefit. Within the kinetic chain of the upper limb, the rotator cuff and scapular muscles stabilise the shoulder and contribute to force transmission during gripping and lifting; weakness or dysfunction proximally can increase compensatory load on the forearm extensors and thereby perpetuate symptoms. Strengthening these muscles may restore more efficient load distribution, while myofascial release reduces extensor tightness and may improve local circulation and tissue mobility. The combined approach therefore targets both the proximal contributor and the local pathology.

Our findings are consistent with previous work. Eccentric and progressive resistance exercise has repeatedly been shown to promote tendon adaptation and reduce symptoms in lateral epicondylitis. Studies that incorporated shoulder and scapular strengthening into elbow rehabilitation have reported superior outcomes compared with elbow exercises alone, supporting the inclusion of rotator cuff strengthening in our protocol. Similarly, myofascial release and related manual therapies have been associated with reductions in pain and improvements in function in upper-limb musculoskeletal disorders. Reviews of conservative management have concluded that no single modality is consistently superior, reinforcing the value of multimodal approaches such as the one evaluated here.

Clinically, these results suggest that clinicians managing tennis elbow should assess and, where indicated, address shoulder and scapular strength rather than focusing exclusively on the elbow. A combined programme of rotator cuff strengthening and myofascial release is inexpensive, straightforward to deliver, and may improve pain, grip function, and overall upper-limb performance.

4.1 Limitations

Several limitations should be acknowledged. The study used a single-group pre–post design without a control or comparison group, so improvement cannot be attributed to the intervention with certainty, and the natural history of the condition and placebo effects cannot be excluded. The sample size was small (n = 20) and recruited by convenience from a single centre, which limits generalisability. Follow-up was limited to the four-week intervention period, so the durability of benefit and recurrence rates are unknown. Outcomes were self-reported or assessor-rated and were not blinded. Future research should employ randomised controlled designs with an active comparator, larger and more diverse multicentre samples, blinded assessment, and longer follow-up, and should further investigate the biomechanical mechanisms underlying the observed effects.

5. Conclusion

Within its limitations, this study demonstrates that a four-week programme of rotator cuff strengthening exercises combined with myofascial release significantly reduces pain and disability and improves function in patients with tennis elbow. By addressing both proximal muscle weakness and local fascial

restriction, this combined approach offers a practical and comprehensive treatment option. Larger randomised controlled trials with longer follow-up are warranted to confirm these findings and establish the durability of benefit.

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