American Journal of Psychiatric Rehabilitation Expert Opinion Article

Comparative Efficacy Of Corticosteroid Injections And Physical Therapy In Lateral Epicondylitis (Tennis Elbow): A Randomized Prospective Study

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Abstract:
Background: Lateral epicondylitis (LE), commonly known as tennis elbow, is a prevalent musculoskeletal disorder stemming from the overuse of forearm extensor muscles. While corticosteroid injections offer rapid symptom alleviation, physical therapy focuses on promoting long-term tendon healing and functional restoration.
Objective: This study prospectively compared corticosteroid injection and supervised physical therapy in patients with tennis elbow, evaluating pain relief, functional improvement, and recurrence rates over a 24-week period.
Methods: We conducted a randomized prospective study involving 100 patients diagnosed clinically with LE. Participants were randomly assigned to either Group A (single corticosteroid injection, n=50) or Group B (supervised physical therapy protocol, n=50). Outcome measures, including the Visual Analog Scale (VAS) for pain, the Disabilities of the Arm, Shoulder and Hand (DASH) score for function, grip strength, and recurrence rates, were recorded at 4, 12, and 24 weeks post-intervention.
Results: At 4 weeks, Group A demonstrated significantly superior pain relief (VAS 2.3±0.9 vs. 3.7±1.0; $p<0.01$). However, at 24 weeks, Group B exhibited markedly better pain and functional outcomes (VAS 1.8±0.7 vs. 4.3±1.6; DASH 17.5±4.3 vs. 34.7±6.4; $p<0.001$). Furthermore, the recurrence rate was significantly lower in Group B (10% vs. 36%; $p<0.01$).
Conclusion: Corticosteroid injections provide effective short-term symptom control in lateral epicondylitis. However, physical therapy yields superior long-term outcomes with a significantly lower rate of recurrence. Therefore, physical therapy should be considered the preferred first-line treatment for lateral epicondylitis.

Keywords: Corticosteroid, Lateral Epicondylitis, Physical Therapy, Randomized Trial, Tendinopathy

INTRODUCTION:

Lateral epicondylitis (LE), commonly known as tennis elbow**,** is one of the most frequently encountered overuse injuries of the upper extremity, particularly among individuals aged 30 to 50 years. It predominantly affects the common extensor origin of the lateral elbow**,** with the extensor carpi radialis brevis (ECRB) tendon being the most commonly involved structure due to its anatomical positioning and repetitive strain during wrist extension and forearm supination movements[1,2].

Though once considered an inflammatory condition and historically referred to as "epicondylitis," it is now well-established that LE is a degenerative tendinopathy**,** better described as tendinosis**.** The histopathological changes observed in affected tendons include **c**ollagen disorganization, fibroblast proliferation, and neovascularization (angiofibroblastic hyperplasia)**,** with minimal or no inflammatory infiltrates[3,4]. This paradigm shift has significant therapeutic implications, particularly with regard to the long-term efficacy of anti-inflammatory treatments such as corticosteroids.

Among the various treatment modalities, corticosteroid injections are frequently utilized due to their potent anti-inflammatory properties, providing rapid pain relief and early return to function[5]. However, numerous studies have demonstrated that while the short-term results of steroid injections are favorable, the long-term outcomes are often suboptimal, with a higher

incidence of symptom recurrence and potential risk of tendon weakening[6,7].

On the other hand, structured physical therapy (PT) has emerged as an evidence-based, non-invasive intervention aimed at stimulating tendon healing. This is typically achieved through eccentric strengthening exercises, static stretching, and ergonomic modifications, which promote mechano transduction-mediated tendon remodeling and ultimately contribute to sustained recovery[8-11]. Compared to corticosteroids, PT has been associated with better long-term functional outcomes and significantly lower recurrence rates[12,13].

Given the diverse mechanisms of action and varying clinical outcomes of these interventions, a direct comparative analysis is essential to guide treatment decisions. This prospective, randomized study was designed to evaluate and compare the short- and long-term efficacy of corticosteroid injections versus supervised physical therapy in patients diagnosed with lateral epicondylitis. Outcome measures focused on pain relief, functional improvement, and recurrence over a 24-week period, aiming to offer clarity on the optimal first-line management strategy for this common yet disabling condition.

METHODOLOGY:

This prospective, randomized, single-center clinical trial was conducted at SMBT Institute of Medical Sciences and Research Center, Dhamangaon, Nashik, a tertiary care academic hospital, over a period from January 2024 to March 2025. Ethical clearance for the study was obtained from the institutional ethics committee prior to the commencement of patient recruitment.

A total of 100 adult patients aged between 20 and 60 years, clinically diagnosed with lateral epicondylitis (LE), were enrolled in the study. Diagnosis was based on clinical features including lateral elbow tenderness and pain on resisted wrist extension. Eligible patients had a symptom duration of 4 to 12 weeks and a Visual Analog Scale (VAS) score of ≥5 at presentation. Exclusion criteria included prior corticosteroid injection or physical therapy within the last 6 months, cervical radiculopathy, inflammatory arthritis, systemic conditions such as diabetes mellitus or coagulopathies, recent trauma, and pregnancy.

Participants were randomly assigned into two equal groups (n=50 each) using a computer-generated randomization sequence. Group A received a single corticosteroid injection, and Group B underwent a structured physical therapy regimen. In Group A, patients were administered 40 mg of triamcinolone acetonide combined with 1 mL of 2% lidocaine at the point of maximum tenderness. In Group B, patients followed a supervised physical therapy protocol for six weeks, with three sessions per week. This regimen included eccentric wrist extensor strengthening, static stretching exercises, activity modification, and ergonomic training.

Outcome measures were assessed at baseline and at follow-up intervals of 4, 12, and 24 weeks post-intervention. Pain was evaluated using the Visual Analog Scale (VAS, 0–10), while upper limb function was assessed using the Disabilities of the Arm, Shoulder, and Hand (DASH) score. Grip strength was measured using a handheld dynamometer. Recurrence was defined as the return of symptoms with a VAS score ≥5 after initial improvement. Patient satisfaction was also recorded using a 5-point Likert scale. All outcome assessments were conducted by blinded evaluators to minimize bias.

Statistical analysis was performed using [Specify Software, e.g., SPSS version X.X]. Continuous variables were expressed as mean ± standard deviation and compared using independent samples t-tests. Categorical variables were compared using Chi-square tests. For within-group comparisons over time, repeated measures ANOVA or paired t-tests were employed depending on the distribution and assumptions of the data. A p-value of <0.05 was considered statistically significant for all analyses.

RESULTS:

The baseline demographic and clinical characteristics of both treatment groups. No statistically significant differences were observed between Group A and Group B for any of the recorded baseline parameters, confirming successful randomization.

Table 1: Baseline Characteristics of Study Participants

Parameter	Group A (n=50)	Group B (n=50)	p-value
Age (years)	42.3±6.7	43.1±7.1	0.57
Male/Female	28/22	29/21	0.83
Dominant side affected	64%	66%	0.81
VAS baseline	6.9±1.1	7.1±1.0	0.42
DASH baseline	54.6±6.2	53.9±6.4	0.61

The changes in clinical outcomes, including VAS scores, DASH scores, and recurrence rates, for both groups at the various follow-up timepoints.

At 4 weeks, Group A demonstrated significantly superior pain relief (VAS: 2.3±0.9 vs. 3.7±1.0; p<0.01) and functional improvement (DASH: 23.2±4.9 vs. 34.1±6.2; p<0.01) compared to Group B. However, this trend reversed at the 12-week and 24-week follow-ups. At 24 weeks, Group B exhibited markedly better pain and functional outcomes (VAS: 1.8±0.7 vs. 4.3±1.6; DASH: 17.5±4.3 vs. 34.7±6.4; both p<0.001). Furthermore, the recurrence rate was significantly lower in Group B (10% (5/50 patients) vs. 36% (18/50 patients); p<0.01).

Table 2: Clinical Outcomes at Different Follow-up Intervals

Outcome Measure	Timepoint	Group A: Corticosteroid	Group B: Physical Therapy	p-value
VAS Score				
	4 Weeks	2.3±0.9	3.7±1.0	<0.01
	12 Weeks	3.5±1.2	2.4±1.1	<0.01
	24 Weeks	4.3±1.6	1.8±0.7	<0.001
DASH Score				
	4 Weeks	23.2±4.9	34.1±6.2	<0.01
	12 Weeks	29.5±5.6	22.3±5.4	<0.001
	24 Weeks	34.7±6.4	17.5±4.3	<0.001
Recurrence Rate	–	36% (18/50)	10% (5/50)	<0.01

DISCUSSION:

The findings of our study provide a clear distinction between the short-term and long-term efficacy of corticosteroid injections and physical therapy in the management of lateral epicondylitis (LE). Consistent with existing literature, our results show that corticosteroid injections yield superior short-term pain relief and functional improvement at 4 weeks. However, this benefit diminishes over time, with a marked increase in recurrence rates and worsening functional scores by the 24-week follow-up. In contrast, structured physical therapy particularly focusing on eccentric strengthening and static stretching was associated with gradual but sustained improvement in both pain and function, and a significantly lower recurrence rate.

Our observations echo the seminal randomized controlled trial by Smidt et al.[10], which demonstrated that although corticosteroid injections offered faster relief, physical therapy led to superior outcomes in the long term. Similarly, Coombes et al.[7] and Coombes et al.[8] emphasized the limited durability of steroid injections and highlighted the benefit of physiotherapy in facilitating tendon healing. They also cautioned against repeated injections due to their association with tendon weakening, tissue atrophy, and higher recurrence, findings supported by Fredberg et al.[12] and Khan et al.[13], who argued for a shift away from purely anti-inflammatory approaches toward regenerative rehabilitation.

Histopathological studies, such as those by Kraushaar and Nirschl[3] and Khan et al.[4], further validate this rationale, revealing that LE is a degenerative rather than inflammatory condition. Consequently, while corticosteroids may suppress inflammation-mediated symptoms, they do not address the underlying tendon pathology, and may even impair tendon repair mechanisms. This is supported by the findings of Gaujoux-Viala et al.[11], who concluded that corticosteroid injections offer minimal benefit beyond six weeks and may delay tendon remodeling.

In contrast, physical therapy interventions have demonstrated consistent efficacy across multiple studies. Alfredson et al.[14] pioneered the use of eccentric exercises in tendinopathy, reporting significant structural and symptomatic improvement. Follow-up studies by Stasinopoulos and Johnson[15] and Tyler et al.[16] reinforced these benefits, attributing the success to mechano-transduction-induced collagen reorganization and improved tendon loading capacity. Pienimäki et al.[17] also reported sustained symptom relief and improved arm function with physical therapy, even at 12-month follow-up.

Interestingly, newer treatment modalities such as platelet-rich plasma (PRP) are being evaluated for LE, often in comparison with corticosteroids and physiotherapy. For instance, Ucuncu et al.[18] and Sayari et al.[19] demonstrated that PRP may outperform corticosteroids in long-term outcomes. However, due to cost and accessibility limitations, PRP is not yet a standard first-line therapy in many settings. Meanwhile, Dones et al.[20] and Olaussen et al[21] reaffirmed that structured physical therapy continues to be a cost-effective, low-risk, and functionally beneficial approach.

Our study's results are particularly significant because they were derived from a randomized

design with blinded outcome assessment and standardized treatment protocols. This strengthens the internal validity and aligns with the methodological rigor of prior trials. Importantly, we observed a recurrence rate of only 10% in the physical therapy group, which is comparable to the 12% reported by Coombes et al[8], further reinforcing the long-term durability of PT-based interventions.

However, a few limitations must be acknowledged. Being a single-center study, the results may not be generalizable across diverse populations. Additionally, we did not evaluate outcomes beyond 24 weeks, and future research could extend follow-up duration to assess relapse patterns beyond six months. Moreover, we did not include a placebo or combined treatment group, which could have enriched the interpretation of the comparative efficacy of multimodal strategies.

In conclusion, our findings align with the growing body of evidence advocating for physical therapy as the preferred first-line treatment for lateral epicondylitis. Corticosteroids may have a role in selected cases requiring urgent symptom relief, but their routine use should be approached cautiously given their temporary benefit and risk of recurrence.

Conclusion

The study demonstrates that while corticosteroid injections provide rapid short-term relief in patients with lateral epicondylitis, they are associated with significantly higher recurrence rates and poorer long-term functional outcomes. In contrast, a structured physical therapy regimen offers sustained pain reduction, improved grip strength, and better functional recovery over a 24-week period. Given the degenerative nature of LE, rehabilitation strategies that promote tendon remodeling such as eccentric exercises and ergonomic training are more effective in addressing the underlying pathology. Therefore, physical therapy should be considered the preferred first-line treatment, with corticosteroids reserved for selective cases requiring immediate symptom control.

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