

Efficacy and Safety of Local Infiltration of Triamcinolone Acetate Injection in Tennis Elbow – An Interventional Study

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Abstract

Introduction: Tennis elbow, or lateral epicondylitis, is a common painful tendinopathy that can impair upper-limb function and occupational activities. Local corticosteroid injection is frequently used for rapid symptomatic relief. This study evaluated the clinical efficacy and safety of local triamcinolone acetate infiltration in patients with tennis elbow.

Materials and Methods: A prospective interventional study was conducted at a tertiary care hospital from June 2025 to June 2026. A total of 100 adults with clinically diagnosed lateral epicondylitis were enrolled. Patients received local infiltration of triamcinolone acetate at the site of maximal tenderness under aseptic precautions. Pain and functional status were assessed using the Visual Analogue Scale (VAS) and Patient-Rated Tennis Elbow Evaluation (PRTEE) score at baseline and at 2, 6, 12, and 24 weeks. Treatment response and adverse events were also documented. Repeated-measures analysis of variance was used to assess changes over follow-up, with $p < 0.05$ considered statistically significant.

Results: The mean age of participants was 44.1 ± 9.2 years, and 58.0% were male. The mean baseline VAS score decreased from 7.1 ± 1.0 to 4.2 ± 1.3 at 2 weeks and 3.1 ± 1.4 at 6 weeks, with a score of 4.0 ± 1.7 at 24 weeks ($p < 0.001$). Mean PRTEE score decreased from 64.3 ± 9.8 at baseline to 34.8 ± 11.0 at 6 weeks and remained improved at 24 weeks (40.9 ± 12.3 ; $p < 0.001$). Good or excellent clinical response was observed in 74.0% at 6 weeks and 60.0% at 24 weeks. Adverse events were predominantly mild; injection-site pain occurred in 14.0%, and no infection or tendon rupture was observed.

Conclusion: Local triamcinolone acetate infiltration provided significant short-term improvement in pain and functional status and was generally well tolerated in patients with tennis elbow. The greatest clinical benefit was observed at 6 weeks, with some reduction in treatment effect during later follow-up.

Keywords: Tennis elbow; Lateral epicondylitis; Triamcinolone acetate; Corticosteroid injection; PRTEE.

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Introduction

Tennis elbow, or lateral epicondylitis, is a common musculoskeletal condition characterized by pain and tenderness around the lateral epicondyle, often accompanied by reduced grip strength and difficulty performing activities involving wrist and forearm movements [1]. Despite its name, the condition is not restricted to tennis players and frequently affects individuals engaged in repetitive occupational or recreational activities. The disorder usually results from repetitive mechanical loading of the common extensor tendon, particularly the extensor carpi radialis brevis, leading to tendinopathic changes and persistent pain [2,3].

Management of tennis elbow is generally conservative and includes activity modification, rest, physiotherapy, stretching and strengthening exercises, non-steroidal anti-inflammatory drugs, bracing, and local injection therapies [4,5]. Although many patients improve spontaneously, persistent symptoms may substantially interfere with occupational activities and quality of life. Local corticosteroid injection has traditionally been used for patients with persistent symptoms because of its ability to provide rapid reduction in pain and local inflammation [6]. Triamcinolone acetate, a long-acting corticosteroid, may therefore provide symptomatic relief when infiltrated around the affected tendon [7,8].

However, the benefits of corticosteroid injection need to be considered alongside potential adverse effects, including transient post-injection pain, local skin depigmentation, subcutaneous fat atrophy, infection, and, rarely, tendon-related complications [9]. Furthermore, symptomatic improvement following corticosteroid injection may vary over time, with some patients experiencing recurrence of symptoms during longer follow-up [10]. Evaluation of both clinical efficacy and safety is therefore important to determine its usefulness in routine management of tennis elbow.

The present study aimed to evaluate the efficacy and safety of local infiltration of triamcinolone acetate injection in patients with tennis elbow by assessing changes in pain, functional status, clinical response, and treatment-related adverse events during follow-up.

Materials and Methods

A prospective interventional study was conducted in a tertiary care hospital from May 2025 to May 2026 to evaluate the efficacy and safety of local infiltration of triamcinolone acetate injection in patients with tennis elbow (lateral epicondylitis). A total of 100 patients fulfilling the predefined eligibility criteria were enrolled. The study was conducted after obtaining approval from the

Institutional Ethics Committee, and written informed consent was obtained from all participants before enrolment.

Adult patients presenting with clinically diagnosed lateral epicondylitis, characterized by pain and tenderness over the lateral epicondyle with pain reproduced by resisted wrist or finger extension, were included. Patients with a history of trauma or fracture around the elbow, previous elbow surgery, inflammatory or infective arthritis, cervical radiculopathy, peripheral neuropathy, coagulopathy, local skin infection, or known hypersensitivity to corticosteroids were excluded. Patients who had received a corticosteroid injection around the affected elbow during the preceding few months were also excluded.

After clinical assessment and documentation of baseline characteristics, each patient received local infiltration of triamcinolone acetate at the site of maximal tenderness over the lateral epicondyle using aseptic precautions. The procedure was performed by an experienced orthopaedic clinician. Baseline pain and functional status were assessed using the Visual Analogue Scale (VAS) and Patient-Rated Tennis Elbow Evaluation (PRTEE) score. Patients were subsequently evaluated at 2, 6, 12, and 24 weeks after injection to assess changes in pain, functional status, and overall clinical response. Treatment response was categorized according to the degree of improvement in symptoms and functional limitation. Safety was assessed at each follow-up visit by documenting local and systemic adverse events, including injection-site pain, transient worsening of pain, skin depigmentation, subcutaneous fat atrophy, infection, and any other clinically significant complications. Data were recorded using a structured case record form and subsequently entered into a computerized database for statistical analysis. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequency and percentage. Changes in VAS and PRTEE scores across follow-up visits were assessed using repeated-measures analysis of variance, with appropriate post-hoc comparisons where applicable. A p-value <0.05 was considered statistically significant.

Results

The study included 100 patients with tennis elbow. The mean age of the participants was 44.1 ± 9.2 years, with the majority aged 41–50 years (36.0%), followed by 31–40 years (28.0%). Males constituted 58.0% of the study population. The right elbow was affected in 57.0% of patients, while 78.0% had involvement of the dominant

hand. Repetitive wrist activity was reported by 64.0% of participants. (Table 1)

Table 1: Baseline Demographic Characteristics of Study Participants (N=100)

Variable	Category	n (%)
Age (years)	20–30	12 (12.0)
	31–40	28 (28.0)
	41–50	36 (36.0)
	51–60	18 (18.0)
	>60	6 (6.0)
Sex	Male	58 (58.0)
	Female	42 (42.0)
Dominant hand affected	Yes	78 (78.0)
Side involved	Right	57 (57.0)
	Left	35 (35.0)
	Bilateral	8 (8.0)
Occupation involving repetitive wrist activity	Yes	64 (64.0)

The mean duration of symptoms was 5.8 ± 2.9 months. The mean baseline VAS pain score was 7.1 ± 1.0 , while the mean PRTEE score was 64.3 ± 9.8 . Lateral epicondylar tenderness was present in all patients, with positive Cozen's, Mill's, and Maudsley's tests observed in 91.0%, 86.0%, and 83.0%, respectively. Previous conservative treatment had been received by 39.0% of patients. (Table 2)

Table 2: Baseline Clinical Characteristics of Study Participants (N=100)

Clinical characteristic	Mean $\pm$ SD / n (%)
Duration of symptoms (months)	5.8 ± 2.9
Baseline VAS pain score	7.1 ± 1.0
Baseline PRTEE score	64.3 ± 9.8
Tenderness over lateral epicondyle	100 (100.0)
Positive Cozen's test	91 (91.0)
Positive Mill's test	86 (86.0)
Positive Maudsley's test	83 (83.0)
Previous conservative treatment	39 (39.0)
Previous NSAID use	72 (72.0)
Previous physiotherapy	31 (31.0)

Following local triamcinolone acetate injection, the mean VAS pain score decreased from 7.1 ± 1.0 at baseline to 4.2 ± 1.3 at 2 weeks and 3.1 ± 1.4 at 6 weeks. A modest increase was observed thereafter, with mean scores of 3.6 ± 1.6 at 12 weeks and 4.0 ± 1.7 at 24 weeks, while pain remained lower than baseline throughout follow-up. (Table 3)

Table 3: Change in VAS Pain Score Following Local Triamcinolone Acetate Injection (N=100)

Follow-up	Mean VAS $\pm$ SD	Mean reduction from baseline	p-value
Baseline	7.1 ± 1.0	-	-
2 weeks	4.2 ± 1.3	2.9	<0.001
6 weeks	3.1 ± 1.4	4.0	<0.001
12 weeks	3.6 ± 1.6	3.5	<0.001
24 weeks	4.0 ± 1.7	3.1	<0.001

Functional status also improved following treatment, with the mean PRTEE score decreasing from 64.3 ± 9.8 at baseline to 45.7 ± 10.2 at 2 weeks and 34.8 ± 11.0 at 6 weeks. The mean scores at 12 and 24 weeks were 37.6 ± 11.8 and 40.9 ± 12.3 , respectively, indicating sustained functional improvement compared with baseline. (Table 4)

Table 4: Change in PRTEE Score Following Local Triamcinolone Acetate Injection (N=100)

Follow-up	Mean PRTEE $\pm$ SD	Mean reduction from baseline	p-value
Baseline	64.3 ± 9.8	-	-
2 weeks	45.7 ± 10.2	18.6	<0.001
6 weeks	34.8 ± 11.0	29.5	<0.001
12 weeks	37.6 ± 11.8	26.7	<0.001
24 weeks	40.9 ± 12.3	23.4	<0.001

The proportion of patients achieving a good or excellent clinical response increased from 50.0% at 2 weeks to 74.0% at 6 weeks. Good or excellent responses were observed in 68.0% and 60.0% of patients at 12 and 24 weeks, respectively, indicating the greatest overall response at 6 weeks with some reduction thereafter. (Table 5)

Table 5: Overall Clinical Response Following Triamcinolone Acetate Injection (N=100)

Clinical response	2 weeks n (%)	6 weeks n (%)	12 weeks n (%)	24 weeks n (%)
Excellent	12 (12.0)	31 (31.0)	27 (27.0)	22 (22.0)
Good	38 (38.0)	43 (43.0)	41 (41.0)	38 (38.0)
Moderate	34 (34.0)	18 (18.0)	21 (21.0)	25 (25.0)
Poor	16 (16.0)	8 (8.0)	11 (11.0)	15 (15.0)
Good/excellent response	50 (50.0)	74 (74.0)	68 (68.0)	60 (60.0)

Adverse events were generally mild, with injection-site pain being the most frequently reported event (14.0%), followed by transient worsening of pain (8.0%). Local skin depigmentation occurred in 3.0% and subcutaneous fat atrophy in 2.0% of patients. No infection, tendon rupture, or clinically significant systemic adverse effects were observed. Overall, 24.0% of patients experienced at least one adverse event. (Table 6)

Table 6: Adverse Events Following Local Triamcinolone Acetate Injection (N=100)

Adverse event	n (%)
Injection-site pain	14 (14.0)
Transient increase in pain	8 (8.0)
Local skin depigmentation	3 (3.0)
Subcutaneous fat atrophy	2 (2.0)
Local erythema	2 (2.0)
Infection	0 (0.0)
Tendon rupture	0 (0.0)
Systemic adverse effects	0 (0.0)
Any adverse event	24 (24.0)

Discussion

In the present study, local infiltration of triamcinolone acetate was associated with a marked early reduction in pain and improvement in functional status. The mean VAS score decreased from 7.1 ± 1.0 at baseline to 3.1 ± 1.4 at 6 weeks, while the mean PRTEE score decreased from 64.3 ± 9.8 to 34.8 ± 11.0 during the same period. These findings are consistent with the established short-term efficacy of corticosteroid injections in lateral epicondylitis. Bisset et al. reported significantly better clinical outcomes with corticosteroid injection at 6 weeks compared with physiotherapy or a wait-and-see approach, supporting the rapid symptomatic benefit observed in the present study [11].

The improvement observed in the present study was greatest at 6 weeks, after which a modest deterioration in pain and functional scores was noted. This pattern is clinically important and closely parallels findings from previous trials demonstrating that corticosteroid injections provide rapid relief but that the benefit may diminish with longer follow-up. Smidt et al. found that corticosteroid injections produced clinically relevant short-term improvements in pain, global recovery, and grip strength, but these advantages were not maintained during intermediate- and long-term follow-up [12]. Similarly, Bisset et al. observed substantial recurrence after the initial benefit of corticosteroid injection [11].

The 24-week findings in the present study, with VAS and PRTEE scores remaining improved compared with baseline but showing some loss of the initial treatment effect, are also consistent with the findings of Coombes et al. In their randomized controlled trial, corticosteroid injection produced less complete recovery and substantially greater recurrence at 1 year than placebo injection, although early clinical improvement was evident and also reported recurrence in 54% of patients receiving corticosteroid injection compared with 12% following placebo injection [12]. Thus, the progressive increase in pain scores after the early peak of benefit in the present study may reflect the recognized limitation of corticosteroid therapy in providing sustained long-term benefit.

The safety profile observed in the present study was generally favorable, with adverse events predominantly mild and local. Injection-site pain and transient worsening of pain were the most frequent events, while skin depigmentation and subcutaneous fat atrophy occurred infrequently; no infection, tendon rupture, or significant systemic adverse effects were observed. The overall safety findings are compatible with previous evidence describing corticosteroid injections as generally well tolerated, although local complications remain recognized concerns. Importantly, the evidence synthesized by Krogh et al. indicates that the apparent short-term efficacy of glucocorticoid injections must be interpreted alongside uncertainty

regarding longer-term effectiveness, while Hohmann et al. similarly demonstrated greater short-term benefit with corticosteroids compared with PRP but more favorable longer-term outcomes with PRP [14,15]. The strengths of the present study include its prospective interventional design, clearly defined clinical outcomes, standardized assessment of pain and functional status using VAS and PRTEE scores, multiple follow-up assessments extending to 24 weeks, and systematic documentation of treatment-related adverse events.

However, the study has certain limitations, including the relatively modest sample size, single-centre design, absence of a control or comparator group, and relatively short follow-up period, which limit the ability to determine comparative efficacy and long-term recurrence. In addition, blinding was not performed, and subjective outcome measures may have introduced reporting or observer bias. Further multicentre randomized controlled studies with larger sample sizes and longer follow-up are warranted to establish the durability and comparative effectiveness of local triamcinolone acetate injection.

Conclusion

Local infiltration of triamcinolone acetate provided substantial short-term relief of pain and improvement in functional status among patients with tennis elbow, with the greatest clinical improvement observed during the early follow-up period. Although some reduction in treatment benefit was observed during later follow-up, outcomes remained improved compared with baseline. The treatment was generally well tolerated, with predominantly mild and transient adverse events and no major complications observed. These findings support local triamcinolone acetate infiltration as a useful option for short-term symptomatic management of tennis elbow, while appropriate patient selection and follow-up remain important.

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