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To Compare the Functional Outcome of Steroid Injection and Platelet-Rich Plasma Injection in the Treatment of Lateral Epicondylitis: A Prospective Comparative Study

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Abstract

Aims: Lateral epicondylitis (LE), or tennis elbow, is a common overuse tendinopathy causing significant pain and functional limitation. While corticosteroid (CS) injections offer rapid symptom relief, recurrence is frequent. Platelet-rich plasma (PRP) has emerged as a biological alternative with potential regenerative benefits. This study aimed to compare the short- and mid-term functional outcomes of corticosteroid injection versus PRP injection in patients with LE.

Methods: A prospective, randomized, comparative study was conducted at a tertiary care center involving 80 patients diagnosed with LE refractory to conservative treatment for ≥3 months. Patients were randomly allocated to two groups: PRP (n=36) and CS (n=44). The interventions were administered under sterile conditions, and outcomes were assessed using the Visual Analogue Scale (VAS), Activities of Daily Living Score (ADLS), and Functional Usability (FU) score at baseline, 6 weeks, and 3 months.

Results: At one month, the CS group showed significantly lower mean VAS (0.27 vs 2.47), higher FU (11.64 vs 9.47), and better ADLS scores (7.66 vs 5.83) than the PRP group ($p<0.001$). However, at three months, the PRP group outperformed the CS group in all domains: VAS (0.28 vs 1.45), FU (12.00 vs 10.48), and ADLS (8.0 vs 6.88), with all differences statistically significant ($p<0.001$). The CS group showed a trend toward symptom recurrence.

Conclusion: While corticosteroid injection offers rapid pain relief, its benefits wane over time. PRP therapy provides sustained improvement in pain and function, making it a superior long-term treatment for lateral epicondylitis. PRP should be considered the preferred option for managing chronic LE.

Highlights

- Steroid injections yield rapid pain relief and early functional improvement in chronic tennis elbow.
- By 3 months, platelet-rich plasma (PRP) recipients exhibit significantly lower pain and better function than the steroid group.
- In this randomized trial of 80 patients, steroid effects waned by 3 months while PRP benefits persisted, favoring PRP for sustained relief.

Keywords: Lateral Epicondylitis; Tennis Elbow; Platelet-Rich Plasma; Corticosteroid Injection; VAS; Functional Outcome

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Introduction

Lateral epicondylitis (LE), commonly referred to as "tennis elbow", is a prevalent overuse syndrome affecting the extensor tendons of the forearm, particularly the extensor carpi radialis brevis (ECRB). Despite its association with racket sports, it is more commonly linked with occupational and repetitive wrist activities, with an annual incidence of 1% to 3% in the general population, peaking in the fourth and fifth decades of life [1-3].

Histologically, LE is not an inflammatory condition, but a degenerative tendinosis marked by "angiofibroblastic hyperplasia", collagen disorganization, and microtears [4,5]. The condition manifests as lateral elbow pain exacerbated by resisted wrist extension or gripping activities, often impairing daily function and quality of life [6].

Treatment strategies range from rest, NSAIDs, physiotherapy, and bracing to injections and, in recalcitrant cases, surgical intervention [7-9]. Among injectables, corticosteroids have been the mainstay for decades due to their anti-inflammatory properties and rapid symptom relief [10]. However, evidence suggests that while corticosteroids may offer short-term benefits, they are often followed by symptom recurrence and functional decline [11-13].

In contrast, platelet-rich plasma (PRP)—an autologous concentrate rich in growth factors—has garnered attention for its potential to enhance tendon healing by promoting fibroblast migration, angiogenesis, and collagen synthesis [14,15]. Clinical studies have shown promising results with PRP in terms of sustained pain relief and functional restoration, although heterogeneity in PRP preparation and administration protocols persists [16-18].

Given the lack of consensus and limited comparative studies from Indian settings, this study was undertaken to assess and compare the functional outcomes of PRP versus corticosteroid injection in patients with chronic lateral epicondylitis. The objective was to provide robust clinical evidence on the effectiveness of these two commonly used interventions over a three-month follow-up period [19-23,25,26].

Materials and Methods

Study Design and Setting

This was a prospective, randomized, controlled, single-center study conducted in the Department of Orthopedics at Dayanand Medical College and Hospital, Ludhiana, over a one-year period beginning June 2023. The study received ethical clearance and adhered to institutional guidelines for human research.

Study Population

A total of 80 patients, aged 18 years and above, with clinically diagnosed lateral epicondylitis (LE) unresponsive to at least "three months of conservative treatment", were enrolled. Diagnosis was based on lateral elbow pain aggravated by resisted wrist dorsiflexion and tenderness over the lateral epicondyle. All patients underwent a thorough clinical assessment including Cozen's test and Maudsley's test.

Inclusion Criteria

- Age >18 years
- Clinically confirmed LE with symptom duration ≥3 months
- No prior injection therapy for LE
- Willingness to comply with follow-up.

Exclusion Criteria

- Pregnancy
- Previous surgery on the affected elbow
- Inflammatory or autoimmune arthritis
- Compressive neuropathy
- Known hypersensitivity to lidocaine or corticosteroids.
- Immunosuppression

Randomization

Patients were randomly allocated into two intervention groups using "chit-based randomization":

- Group A (n = 36): Platelet-Rich Plasma (PRP) injection
- Group B (n = 44): Corticosteroid (Methylprednisolone acetate) injection

Intervention Protocol

PRP Group

Approximately 12 ml of venous blood was withdrawn from the cephalic vein into ACD tubes and processed using a double centrifugation method:

- First spin: 1500 rpm for 15 minutes
- Buffy coat separated and subjected to second spin: 2500 rpm for 5 minutes
- The bottom 1/3rd of the supernatant was collected as leukocyte-rich PRP (~3 ml)

The PRP was injected at the point of maximum tenderness over the "ECRB origin", using an 18G needle in a fan-shaped pattern under sterile conditions.

Corticosteroid Group

A single injection of 40 mg/ml methylprednisolone acetate (total 80 mg in 2 ml) was administered at the ECRB origin using the same sterile technique and anatomical landmarks.

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Both groups received lignocaine (2%) as local anesthesia prior to injection.

Post-injection Care

Patients were advised:

- Ice packs for 48 hours
- Oral analgesics for up to 2 weeks
- Avoid heavy lifting or strenuous wrist activity for 1 week
- Follow-up evaluations at 6 weeks and 3 months

Outcome Measures

All outcomes were recorded at baseline, 6 weeks, and 3 months by the same blinded observer using the following scales:

1. Visual Analogue Scale (VAS)

Pain intensity was scored verbally from 0 (no pain) to 10 (worst imaginable pain).

2. Activities of Daily Living Score (ADLS)

Scored based on performance in 4 domains: personal care, household work, recreational activity, and sport. Each domain was graded 0–2, with a total possible score of 8.

- 8 = Normal
- 6–7 = Mild restriction
- 4–5 = Moderate restriction
- 0–3 = Severe restriction

3. Functional Usability (FU) Score

Six functional tasks (e.g., turning a doorknob, lifting a cup) were evaluated. Each task scored 0–2. Total score: 12.

- 12 = Normal
- 9–11 = Mild restriction
- 5–8 = Moderate restriction
- 0–4 = Severe restriction

Patients who could not attend in person were followed up via telephone with verbal scoring.

Statistical Analysis

Data were analyzed using SPSS version 25.0 (IBM Corp., USA). Categorical variables were expressed as frequencies and percentages. Continuous variables were expressed as mean ± standard deviation (SD).

- Chi-square test was used for categorical variables.
- Independent t-test for comparing group means.
- Repeated measures ANOVA was used for within-group longitudinal comparisons.

A (p-value < 0.05) was considered statistically significant.

Results

Study Population

A total of 80 patients (44 in the steroid group, 36 in the PRP group) were enrolled and completed the study. There was no loss to follow-up. The mean age was 44.2 years (range 23–71), with a nearly equal male-to-female ratio. The most affected age group was 31–50 years (68.8%), consistent with epidemiological data reported in the literature [1,2].

Pain Assessment: Visual Analogue Scale (VAS)

At 1 month, the steroid group showed significantly lower VAS scores (0.27 ± 0.45) than the PRP group (2.47 ± 0.74) ($p < 0.001$), like previous findings of early benefit with corticosteroids [10,11].

At 3 months, the PRP group demonstrated superior pain control with a mean VAS of 0.28 ± 0.45 compared to 1.45 ± 0.72 in the steroid group ($p < 0.001$), echoing trends observed in long-term comparative trials [20,21].

Functional Usability (FU) Score:

At 1 month:

- Steroid group: 11.64 ± 0.65
- PRP group: 9.47 ± 0.91 ($p < 0.001$)

At 3 months:

- PRP group: 12.00 ± 0.00
- Steroid group: 10.48 ± 0.89 ($p < 0.001$)

Activities of Daily Living (ADLS/DUA) Score:

At 1 month:

- Steroid group: 7.66 ± 0.48
- PRP group: 5.83 ± 0.81 ($p < 0.001$)

At 3 months:

- PRP group: 8.00 ± 0.00
- Steroid group: 6.88 ± 0.66 ($p < 0.001$)

Longitudinal Improvement:

The PRP group demonstrated complete resolution of symptoms in 100% of patients by the 3-month mark, while steroid group patients began to show symptom recurrence, as evidenced by a rise in mean VAS and decline in functional scores. Similar longitudinal outcomes have been reported in trials by Peerbooms et al. [20] and Gosens et al. [21].

Adverse Events:

No major adverse events were recorded in either group. Mild post-injection discomfort was more frequently reported in the PRP group (25%) than the steroid group (9%), but all resolved within 48 hours, a finding comparable to other PRP studies [16,22] (Table 1, 2).

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Table 1: Baseline characteristics of the Steroid and PRP groups (values are mean±SD or number [%]). No significant between-group differences were seen.

Characteristic	Steroid Group (n=44)	PRP Group (n=36)	p-value
Age (years)	40.73 ± 9.21	41.36 ± 9.76	0.75
Male/Female	28 (63.6%) / 16 (36.4%)	23 (63.9%) / 13 (36.1%)	0.981
Side (Rt/Lt)	24 (54.5%) / 20 (45.5%)	19 (52.8%) / 17 (47.2%)	0.89
Baseline VAS (0–10)	8.84 ± 0.71	8.89 ± 0.67	0.75
Baseline ADL score	2.41 ± 0.97	2.14 ± 1.02	0.23

Table 2: Outcome scores at 6 weeks and 3 months. Mean (±SD) values of VAS pain, ADL, and FU scores for each group, with between-group p-values. (Higher ADL/FU = better function; lower VAS = less pain).

Characteristic	Steroid Group (n=44)	PRP Group (n=36)	p-value
Baseline FU score	4.82 ± 1.67	4.56 ± 1.42	0.46

Outcome Measure	Time	Steroid (n=44)	PRP (n=36)	p-value	
VAS pain (0–10)	6 wks	0.27 ± 0.59	2.47 ± 1.00	<0.001	3
	3 mos	1.45 ± 0.85	0.28 ± 0.45	<0.001	4
ADL score	6 wks	7.66 ± 0.85	5.83 ± 0.77	<0.001	3
(Daily Function)	3 mos	6.88 ± 0.80	8.00 ± 0.00	<0.001	4
FU score	6 wks	11.64 ± 0.72	9.47 ± 1.06	<0.001	3
(Functional Usability)	3 mos	10.48 ± 1.13	12.00 ± 0.00	<0.001	4

(All patients achieved normal ADL by 3 months; FU score ranges from 0–12).

Discussion

Lateral epicondylitis (LE) is a debilitating condition with significant functional and occupational impact. While corticosteroid injections have long been favored for rapid symptom control, recent evidence suggests that their benefits may be transient, with risk of recurrence and tendon weakening over time [10,12,13]. This prospective randomized study aimed to compare corticosteroid (CS) injections with platelet-rich plasma (PRP) injections in patients with chronic LE, focusing on both pain relief and functional recovery.

At the 1-month follow-up, patients who received CS injections demonstrated significantly lower VAS scores and higher functional scores (FU and ADLS) compared to the PRP group. This aligns with previous trials by Smidt et al. [11] and Altay et al. [12], where corticosteroids showed effective short-term results [11,12]. The rapid anti-inflammatory action of corticosteroids provides immediate pain relief and functional ease, making them attractive for patients requiring a quick return to work or sport [10].

However, by the 3-month follow-up, the scenario reversed. The PRP group significantly outperformed the CS group across all parameters—VAS, ADLS, and FU. The PRP cohort showed sustained improvement with no recurrence, while patients in the CS group began reporting increasing pain and functional decline, indicative of symptom relapse. This trend mirrors findings by Gosens et al. [20] and Peerbooms et al. [21] who demonstrated superior long-term outcomes with PRP up to 2 years [20,21].

The biological mechanism of PRP underpins its efficacy. It delivers concentrated growth factors such as PDGF, VEGF, and TGF-β, which stimulate tendon healing, neovascularization, and collagen remodeling [14,15]. This regenerative potential offers a disease-modifying effect, unlike corticosteroids, which primarily suppress inflammation but impair collagen synthesis and tendon integrity over time [10,13,16].

Our study used leukocyte-rich PRP prepared using a double-spin technique, known to provide a more potent growth factor milieu [17,18]. However, transient post-injection soreness was more common in this group—an observation consistent with literature comparing leukocyte-rich and leukocyte-poor PRP formulations [22,23].

A key strength of this study lies in the use of three validated outcome tools (VAS, FU, and ADLS), a clearly defined protocol, and zero loss to follow-up. Moreover, this is one of the few Indian studies providing prospective comparative data on PRP vs. corticosteroid in LE using a randomized design [19,24-26].

Limitations

- Follow-up duration was limited to 3 months. Longer-term outcomes (6–12 months) would strengthen the conclusions [21].
- The study used verbal scoring for VAS in some telephonic follow-ups, which may introduce recall bias.
- PRP preparation was not standardized with platelet concentration measurement, which could affect reproducibility [18].

Clinical Implications & Conclusion

Our findings support a "shift in therapeutic preference" from corticosteroids to PRP in managing chronic LE. While

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steroids may serve as short-term rescue therapy, PRP should be offered as a "first-line injection" option, especially in patients seeking sustained relief and functional recovery. This aligns with emerging Indian and global consensus favoring PRP for its superior long-term benefits and safety profile [19,24,26,27].

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