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Comparative Efficacy of Platelet Rich Plasma and Cortico-Steroid Injections in Chronic Lateral Epicondylitis: A Prospective Randomized Study

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Abstract: *Background:* Lateral epicondylitis (LE) is a degenerative tendon disorder commonly caused by repetitive strain, leading to persistent pain and functional impairment in some patients despite conservative management. Corticosteroid injections provide short-term relief but are linked to high recurrence and adverse tendon effects. Platelet-rich plasma (PRP), a biologic therapy rich in growth factors, has shown promise for longer-lasting improvement without these risks. This study compares the clinical efficacy and safety of PRP versus corticosteroid injections in patients with chronic LE unresponsive to conservative therapy. *Objectives:* To compare the effectiveness of Platelet-Rich Plasma (PRP) and Corticosteroid (CS) injections in patients with chronic lateral epicondylitis unresponsive to conservative therapy. *Methods:* Fifty patients were randomized into two equal groups (PRP vs. CS). Pain (VAS) and functional impairment (DASH) were assessed at baseline, 2 weeks, 6 weeks, 3 months, and 6 months. *Results:* Both groups showed improvement, but PRP resulted in significantly greater pain relief and functional recovery at 6 months (VAS: 1.44 vs. 3.32; DASH: 25.88 vs. 30.44; $p< 0.001$). *Conclusion:* PRP provides sustained clinical benefits and fewer complications, supporting its use as a preferred intervention in chronic lateral epicondylitis.

Keywords: Platelet-rich plasma (PRP), Corticosteroid, Lateral Epicondylitis, Randomized Trial, Pain Relief, Tendon Healing.

Introduction

Lateral epicondylitis (LE), commonly known as "Tennis Elbow," is one of the most frequent causes of elbow pain in adults, with an estimated prevalence ranging from 1% to 3% in the general population and up to 10% among athletes engaged in racquet sports [1-2]. Historically characterized as an inflammatory condition termed "Epicondylitis" subsequent histopathological studies have clarified that LE is a degenerative tendinopathy rather than an inflammatory process [3-4].

The pathogenesis primarily involves angiofibroblastic tendinosis, a condition characterized by disorganized collagen architecture, fibroblast hyperplasia, and neovascularization, with minimal or no presence of inflammatory cells such as neutrophils or macrophages [5].

The extensor carpi radialis brevis (ECRB) tendon is most commonly implicated, followed by the extensor digitorum communis. Repetitive microtrauma from wrist extension and forearm supination contributes to the degeneration at the ECRB origin, especially in individuals performing occupational or athletic activities involving repetitive upper limb motion [6-7]. Symptoms typically manifest as pain localized to the lateral epicondyle of the humerus and are exacerbated by resisted wrist or finger extension.

Although most cases are self-limiting, with resolution within 6–24 months, up to 20% may progress to chronic pain and disability, significantly impairing quality of life and work productivity [8]. First-line management is conservative, involving NSAIDs, physiotherapy, bracing, and activity

modification. However, in recalcitrant cases, interventional options such as corticosteroid injections are frequently employed due to their rapid analgesic effect [9]. While corticosteroids can provide short-term symptom relief, multiple studies have demonstrated high recurrence rates and potential detrimental effects on tendon structure with repeated use, including tendon thinning and increased risk of rupture [10-11].

In contrast, biologic therapies such as Platelet-Rich Plasma (PRP) have gained attention for their potential regenerative effects. PRP is an autologous concentration of platelets and growth factors including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β1), and vascular endothelial growth factor (VEGF) which are theorized to promote tendon healing through enhanced angiogenesis, fibroblast proliferation, and extracellular matrix synthesis [12-14].

A growing body of randomized controlled trials and meta-analyses suggests that PRP provides superior long-term outcomes compared to corticosteroids, with better pain control and functional improvement at 6 to 12 months [15]. Moreover, PRP lacks the adverse effects associated with corticosteroid use, making it an appealing alternative in chronic cases. Therefore, a direct comparison of these two treatment modalities is clinically relevant to guide evidence-based management of chronic LE. This study was undertaken to compare the clinical efficacy and safety of PRP versus corticosteroid injections in patients with chronic lateral epicondylitis unresponsive to conservative therapy.

Material and Methods

This prospective randomized controlled trial was conducted over 18 months, from July 2023 to December 2024, at the Department of Orthopaedics, Al-Ameen Medical College and Hospital, Vijayapura, Karnataka. Ethical clearance was obtained from the Institutional Ethics Committee, and written informed consent was secured from all participants prior to inclusion in the study.

The study enrolled adults aged 18 years and above who presented with clinically diagnosed lateral epicondylitis lasting longer than six months and who had not responded to at least six weeks of standard conservative management, including physiotherapy, NSAIDs, and bracing. Exclusion criteria included prior corticosteroid injection within the last three months, NSAID use in the preceding week, a BMI over 40, hemoglobin level less than 10 g/dL, pregnancy, previous surgery or deformity of the elbow, and radiographic evidence of joint pathology such as osteoarthritis or loose bodies. Additionally, patients with systemic illnesses (e.g., diabetes mellitus, rheumatoid arthritis, bleeding disorders), neurological conditions (e.g., cervical radiculopathy, peripheral neuropathy, epilepsy), or local infection at the injection site were excluded.

Fifty patients meeting the inclusion criteria were randomized into two equal groups (n = 25 each). Group A received a corticosteroid injection consisting of 1 mL of Triamcinolone Acetonide (40 mg) mixed with 1 mL of 0.25% lignocaine, administered under aseptic conditions at the point of maximal tenderness over the lateral epicondyle. Group B received a platelet-rich plasma (PRP) injection. PRP was prepared by drawing 20 mL of autologous venous blood mixed with citrate phosphate dextrose adenine (CPDA) as an anticoagulant. The sample was centrifuged at 3,500 rpm for 7 minutes to separate plasma, followed by a second spin at 3,000 rpm for 5 minutes to concentrate the buffy coat, yielding approximately 3–4 mL of PRP, which was then injected at the same anatomical site using a sterile technique.

Clinical assessments were performed at 2 weeks, 6 weeks, 3 months, and 6 months post-intervention. Pain intensity was measured using the Visual Analog Scale (VAS), and functional outcome was assessed using the Disabilities of the Arm, Shoulder and Hand (DASH) score. Data were recorded in a structured proforma and analyzed using SPSS software version 26.0. Descriptive statistics were used for demographic variables, while between-group comparisons were made using the Student's t-test and Chi-square test. Statistical significance was set at $p< 0.05$.The sample size was determined based on data from a previous study, assuming a 20%

reduction in mean VAS scores in the PRP group with 80% power and a 5% alpha error. The minimum calculated sample size was 22 per group, which was increased to 25 to compensate for potential loss to follow-up.

Results

Demographic and Baseline Characteristics: A total of 50 patients were enrolled in the study and evenly distributed between the PRP group and the corticosteroid group (25 each). The demographic characteristics were comparable between groups. The most commonly affected age group was 31–40 years, accounting for 48% of patients in both arms. Gender distribution was equal, with 56% male and 44% female participants in each group. Laterality of symptoms was similar, with right-sided involvement in 56% of the PRP group and 48% of the steroid group. The mean duration of symptoms before intervention was 12.09 ± 3.24 weeks in the PRP group and 12.24 ± 5.79 weeks in the corticosteroid group. No statistically significant differences were noted between groups in terms of age, gender, side affected, or duration of symptoms (p> 0.05 for all comparisons) (Table-1).

Table-1: Baseline Characteristics by Treatment Group:

Variable	Category	PRP, n (%)	Steroid, n (%)	Total, n (%)	Test Statistic	P-value
Age Group (years)	21–30	2 (8.0%)	2 (8.0%)	4 (8.0%)	χ^2 = <0.001	1.000
	31–40	12 (48.0%)	12 (48.0%)	24 (48.0%)		
	41–50	8 (32.0%)	8 (32.0%)	16 (32.0%)		
	51–60	3 (12.0%)	3 (12.0%)	6 (12.0%)		
Gender	Male	14 (56.0%)	14 (56.0%)	28 (56.0%)	χ^2 = <0.001	1.000
	Female	11 (44.0%)	11 (44.0%)	22 (44.0%)		
Affected Side	Left	11 (44.0%)	13 (52.0%)	24 (48.0%)	χ^2 = 2.344	0.762
	Right	14 (56.0%)	12 (48.0%)	26 (52.0%)		
Symptom Duration (weeks)	Mean ± SD	12.09 ± 3.24	12.24 ± 5.79	–	χ^2 = 8.921	0.863

Pain Intensity (VAS Scores): At baseline, mean VAS scores were similar between groups (PRP: 6.96 ± 1.06; Steroid: 6.88 ± 1.20; p = 0.804). By 2 weeks, the PRP group demonstrated significantly greater pain reduction compared to the corticosteroid group (4.32 ± 1.41 vs. 5.84 ± 0.99; p< 0.001). This trend continued through subsequent follow-ups at 6 weeks (2.88 ± 1.17 vs. 4.44 ± 1.00; p< 0.001), 3 months (2.80 ± 1.32 vs. 3.88 ± 1.39; p = 0.034), and was most marked at 6 months (1.44 ± 1.16 vs. 3.32 ± 1.41; p< 0.001). These results clearly indicate that PRP offered more sustained and significant pain relief compared to corticosteroids (Fig-1).

Functional Outcome (DASH Scores): Baseline DASH scores were not significantly different between the two groups (PRP: 66.56 ± 9.27; Steroid: 70.76 ± 8.64; p = 0.104). At 2 weeks, the PRP group showed a significantly greater functional improvement (39.92 ± 5.55) compared to the corticosteroid group (51.00 ± 8.53; p< 0.001). This pattern persisted at 6 weeks (35.92 ± 5.55 vs. 47.96 ± 8.53; p< 0.001), 3 months (32.44 ± 5.30 vs. 41.36 ± 9.00; p< 0.001), and 6 months (25.88 ± 5.20 vs. 30.44 ± 5.25; p = 0.003), demonstrating the superior effect of PRP in enhancing arm function over time (Fig-2).

Fig-1: VAS Score Comparison between Groups.

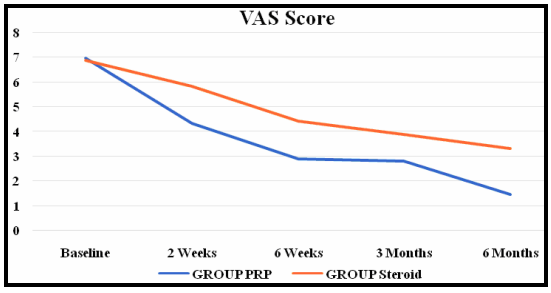
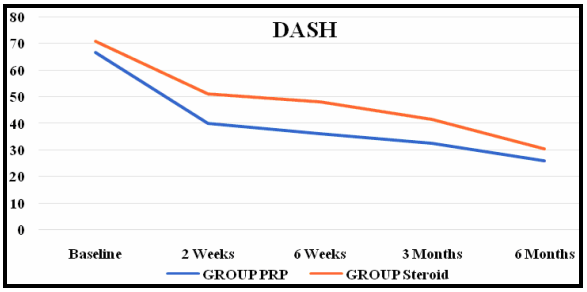
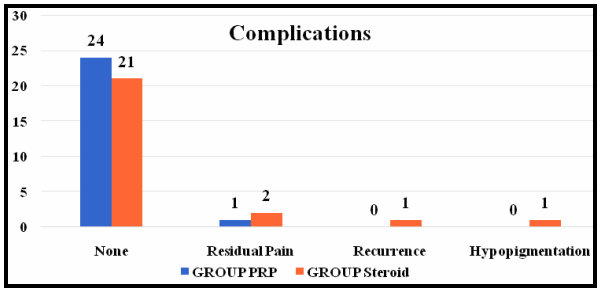


Fig-2: DASH Score Comparison between Groups.



Adverse Effects and Complications: Complication rates were significantly lower in the PRP group. Only one patient (4%) in the PRP group reported residual pain, with no instances of recurrence or skin changes. In contrast, the corticosteroid group had a higher complication rate (16%), including two cases of residual pain (8%), one recurrence (4%), and one case of hypopigmentation (4%). The difference in overall complication rates between the groups was statistically significant ($p = 0.014$), indicating a better safety profile for PRP (Fig-3).

Fig-3: Complications by Treatment Group.



Discussion

Lateral epicondylitis is a prevalent, activity-limiting condition, particularly affecting individuals engaged in repetitive wrist extension. Among injectable treatments, platelet-rich plasma (PRP) and corticosteroids are commonly employed, yet their comparative long-term efficacy remains a subject of clinical investigation. This randomized controlled trial evaluated these two modalities over a six-month follow-up, emphasizing trends in pain relief (VAS) and functional recovery (DASH), and contextualizing findings against eleven key clinical trials and systematic reviews.

Our study population had balanced demographic characteristics across groups, with the majority in the 31–40 age range and a mean symptom duration of approximately 12 weeks. These distributions were consistent with other studies, such as those by Gupta PK [16], Sayadi S [17], and Kalluraya S [18], all reporting similar age and gender parity. Likewise, right-sided involvement dominated, as reflected in studies by Mundla GKR [19] and Gopinath K [20]. No significant baseline differences were observed in our cohort ($p > 0.05$).

Both PRP and Corticosteroid groups demonstrated significant reductions in VAS scores; however, PRP consistently outperformed steroids from 2 weeks onward. At 6 months, PRP showed a VAS of 1.44 ± 1.16 versus 3.32 ± 1.41 in the steroid group ($p < 0.001$). This sustained analgesic effect is echoed across studies by Krishnan MS [21], Sayadi S [17], Tank P [22], and Gupta PK [16], all showing superior VAS reductions in PRP-treated patients often with statistical significance beyond 8 weeks. Systematic reviews, such as Kemp JA's [23], further validate this trajectory, concluding that PRP provides longer-lasting pain control, whereas corticosteroids offer only transient benefit.

Functional recovery, measured by DASH scores, also favored PRP. In our study, both groups improved, but PRP showed significantly better function from 2 weeks onward, with a final score of 25.88 ± 5.20 versus 30.44 ± 5.25 in the CS group ($p = 0.003$). Parallel improvements were seen in other scoring systems (PRTEE, PSFS, OES) across studies by Krishnan MS [21], Kalluraya S [18], and Sayadi S [17]. Notably, Gupta PK [16] observed long-term functional superiority of PRP even at 1-year follow-up, and Dejnek M [24] reported additional benefits in strength recovery. These findings indicate PRP's capacity not just to alleviate symptoms, but to promote tendon healing and restore upper limb function.

Our study found a lower complication rate in the PRP group (4%) compared to corticosteroids (16%), mainly due to recurrence and hypopigmentation in the latter ($p = 0.014$). This trend aligns with Gupta PK [16], Kalluraya S [18], and Krishnan MS [21], who all reported lower recurrence and adverse

event rates with PRP. Although some studies (e.g., Dejnek M [24]) reported transient pain flares post-PRP, serious adverse events were rare, reinforcing its favorable safety profile.

The evidence from our trial and supporting literature suggests that while corticosteroids offer quicker pain relief, their benefits wane beyond 8–12 weeks and are associated with higher recurrence. PRP, on the other hand, yields slower but more durable improvement in both pain and function, with sustained effects up to 12 months. Its regenerative mechanism, grounded in growth factor delivery and collagen remodeling, addresses the pathophysiology of LE more directly than corticosteroids, which only modulate inflammation. Given these findings, PRP emerges as a clinically superior and safer alternative for patients with chronic lateral epicondylitis, especially those unresponsive to conservative treatment. Future large-scale, multicenter studies should aim to standardize PRP preparation protocols and assess cost-effectiveness to support broader clinical adoption.

Conclusion

This study demonstrates that both platelet-rich plasma (PRP) and corticosteroid injections significantly reduce pain and improve function in patients with chronic lateral epicondylitis. However, PRP exhibits superior long-term efficacy in both domains. Patients receiving PRP experienced significantly greater and sustained reductions in pain intensity from 2 weeks through 6 months, as well as consistently better functional recovery as measured by DASH scores. Moreover, PRP was associated with fewer complications and lower recurrence rates compared to corticosteroids. In light of these findings and consistent supporting evidence from contemporary literature, PRP should be considered a preferred treatment modality for patients with chronic lateral epicondylitis who do not respond to conservative therapy. It offers a biologically sound and clinically effective approach that addresses the underlying degenerative process rather than providing temporary symptomatic relief.

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