Original Article

DOI: https://doi.org/10.47648/jswmc2025v15-02-120

Outcome of Autologous Platelet-Rich Plasma Injection in Patients with Lateral Epicondylitis

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Abstract:

Background: Lateral epicondylitis is a common overuse syndrome that shows variable outcome by traditional treatment methods because of poor tendon healing properties secondary to poor vascularization. Platelet rich plasma provides locally high concentration of growth factors and has shown its efficacy in the treatment of lateral epicondylitis.

Methodology: The study was a randomized clinical trial conducted in the Department of Physical Medicine and Rehabilitation, BSMMU, Dhaka, from October 2018 to September 2019. Total 74 patients were purposively selected and randomly allocated in group A (received intra-lesional autologous PRP injection 2ml, counter force elbow orthosis, exercise, ADL and paracetamol) and group B (received counter force elbow orthosis, exercise, ADL and paracetamol). Outcome of treatment was measured using the Visual Analogue Scale (VAS) and Patient-Rated Tennis Elbow Evaluation (PRTEE) questionnaire.

Results: Out of the 74 enrolled patients, 67 completed the study (33 in Group A, 34 in Group B). No significant differences in baseline demographic or clinical variables were noted between groups. Both groups showed significant improvements in VAS and PRTEE scores over time. However, Group A demonstrated significantly greater reductions in VAS scores at the 3rd and 6th months ($p<0.001$) and in PRTEE scores at the 6th month ($p<0.05$), compared to Group B. The mean VAS reduction was 5.6±0.7 in Group A versus 4.6±1.01 in Group B; mean PRTEE reduction was 39.3±10.1 in Group A versus 26±7.1 in Group B.

Conclusion: Autologous PRP injection is an effective treatment modality for lateral epicondylitis, providing superior pain relief and functional improvement compared to conventional conservative management. PRP therapy should be considered a valuable option in the treatment algorithm for chronic tendinopathies such as lateral epicondylitis.

Received date: 08 May 2025

Accepted date: 03 June 2025

Key words: Lateral epicondylitis; Platelet-rich plasma; Tennis elbow; Eccentric exercise.

How to cite this article: Bilkis F, Shoma FK, Rahman MM, Fuad SM, Mohajan K, Haque F, et al. Outcome of autologous platelet-rich plasma injection in patient with lateral epicondylitis. Journal of Sylhet Women's Medical College. 2025 July; 15(02):17-24. https://doi.org/10.47648/jswmc2025v15-02-120

JSWMC 2025 [15(02)] P: 17-24

Introduction:

Lateral epicondylitis, commonly termed as "Tennis Elbow," is a frequent cause of lateral elbow pain and causes functional impairment in daily activities.[1]

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Despite its association with tennis, over 90% of patients diagnosed with lateral epicondylitis do not play tennis, indicating that it affects a diverse population. Both men and women are equally susceptible to this condition, with a higher prevalence among manual laborers who use heavy tools. The dominant arm is most affected.[2] Epidemiological studies reveal that lateral epicondylitis affects approximately 3% of the general population.[3]This condition is most seen in individuals older than 35 years, peaking between the ages of 40 and 50. While it is more prevalent in male tennis players, it does not show a gender preference in the general population. Symptoms typically last between 6 to 24 months, with up to 90% of sufferers recovering within a year. However, 5 to 10% of patients develop chronic symptoms.[4] Diagnosing lateral epicondylitis is primarily clinical, based on a patient's history and characteristic symptoms and signs. Patients usually present with an insidious onset of pain and tenderness over the lateral epicondyle. Activities involving repetitive movement, lifting, and gripping heavy objects often exacerbate the pain. Physical examination typically reveals localized tenderness over the common extensor origin at the lateral epicondyle and exacerbation of pain occurs on resisted dorsiflexion of the wrist, middle finger, or both.

Prognostic factors associated with poorer outcomes at one year include previous occurrences, high physical strain at work, manual jobs, high baseline levels of pain and/or distress, and less social support.[5]

Despite being a well-known condition, the precise etiology and pathophysiology of lateral epicondylitis remain unclear, leading to a lack of definitive treatment guidelines.[6] Initial treatment is usually conservative and includes a variety of methods such as rest, anti-inflammatory medications, orthotics, physical therapy, iontophoresis, exercise, manual therapy, ultrasound therapy, laser therapy, extracorporeal shockwave therapy, acupuncture, taping, and botulinum toxin injections. Most patients respond well to these non-operative treatments and activity modifications. For those with refractory symptoms, corticosteroid injections, dry needling, and various surgical techniques have been proposed.[7] However, these traditional therapies do not address the tendon's poor healing properties due to poor vascularization. Recent advancements in regenerative medicine, such as platelet-rich plasma (PRP) therapy, aim to meet the multifaceted demands of the tendinopathic tendon by providing molecules that enhance healing mechanisms and counteract degenerative processes. [8] PRP is a minimally invasive method that involves concentrating autologous growth factors from the patient's blood. It is defined as a fraction of blood plasma containing a higher concentration of platelets than normal plasma, which serves as a source of growth factors. Although the clinical use of PRP in treating painful tendons is widespread, its efficacy remains controversial.[9] Addressing these uncertainties, this randomized clinical trial aims to evaluate the role of PRP in the chronic stages of lateral epicondylitis. Since PRP is derived from autologous blood, it poses no risk of immune reactions or disease transmission. Current literature does not report hyperplasia, carcinogenesis, or tumor growth following PRP administration. Some patients may experience transient pain and mild swelling, which typically resolves within a few days with ice and paracetamol. This study seeks to fill the gaps in knowledge regarding PRP therapy's effectiveness in managing chronic lateral epicondylitis and potentially offer a reliable treatment alternative for this debilitating condition. Moreover, this study was conducted to determine the outcome of elbow pain in lateral epicondylitis, functional improvement & to compare the outcome between two groups.

Material and Methods:

This randomized clinical trial was carried out in the Department of Physical Medicine and Rehabilitation at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from October 2018 to September 2019. A total of 74 patients clinically diagnosed with lateral epicondylitis were enrolled using purposive sampling and randomized into two equal groups through lottery-based allocation.

Group A (Intervention group) received an intra-lesional autologous platelet-rich plasma (PRP) injection (2 ml), along with a counterforce

elbow orthosis, exercise program, activity of daily living (ADL) modifications, and paracetamol.
Group B (Control group) received the same conservative management—orthosis, exercise, ADL advice, and paracetamol—but without PRP injection.

Inclusion criteria included patients aged 25–70 years with lateral elbow pain for over 3 months, VAS score ≥5, and positive clinical signs (Cozen's and Maudsley's tests). Exclusion criteria were systemic illness, recent trauma, joint instability, prior elbow surgery, corticosteroid or NSAID use before the procedure, hematologic abnormalities, and other specific medical conditions.

Outcome measures included the Visual Analogue Scale (VAS) for pain and the Patient-Rated Tennis Elbow Evaluation (PRTEE) questionnaire for function. Data was collected through face-to-face interviews at baseline, 1st, 3rd, and 6th months of follow-up. Statistical analysis was conducted using SPSS version 25, employing descriptive statistics, Student's t-tests, chi-square tests, and Fisher's exact tests where appropriate, with a significance level of $p<0.05$. The study received ethical clearance from the Institutional Review Board of BSMMU, and informed consent was obtained from all participants.

Results:
A total of 74 patients were enrolled in the study, with 37 patients assigned to Group A and 37 to Group B using a purposive sampling technique in an alternate assignment method. During follow-up, 04 patients from Group A and 3 from Group B did not complete the study for various reasons. Thus, the final analysis included 33 patients in Group A and 34 in Group B.

Table-1: Socio-demographic status of the studied

patients Gender	Number of Patients (n=67)	Percentage (%)	Group A (n=33)	Group B (n=34)	P-value
Male	39	58.21	16	23	0.141
Female	28	41.79	17	11	0.141
Occupation					
Homemaker	23	34.33	14	9	0.489
Day Laborer	8	11.94	4	4	0.489
Service Holder	26	38.8	10	16	0.489
Businessman	10	14.93	5	5	0.489
Educational Status					
Below Primary	16	23.88	5	11	0.407
Primary Passed	12	17.91	7	5	0.407
Below Secondary	7	10.44	4	3	0.407
Secondary & above	32	47.76	17	15	0.407
Socio-economic Status					
Lower	10	14.92	6	4	0.246
Lower Middle	29	43.28	14	15	0.246
Upper Middle	24	35.82	13	11	0.246
High	4	5.97	0	4	0.246
Mean Age (years) ± SD	28-64	-	44.84 ± 8.15	47.29 ± 8.82	-
Mean Age (years) ± SD	28-64	-	44.84 ± 8.15	47.29 ± 8.82	-

*Statistical Test: *Chi-square test* (χ^2) for categorical variables (gender, occupation, education, socioeconomic status); *Independent samples t-test* for comparing mean age between groups.

The table presents the demographic and baseline characteristics of the study participants. The gender distribution shows a slight male predominance (58.21%) with no significant difference between groups (p=0.141). Occupationally, service holders (38.8%) and homemakers (34.33%) were the most common, with similar distributions between groups (p=0.489). Educational status varied, with nearly half having secondary education or higher (47.76%), again with no significant differences

(p=0.407). Socio-economic status was predominantly lower middle class (43.28%), with no significant group differences (p=0.246). The mean ages were similar between groups, with Group A averaging 44.84 years and Group B 47.29 years.

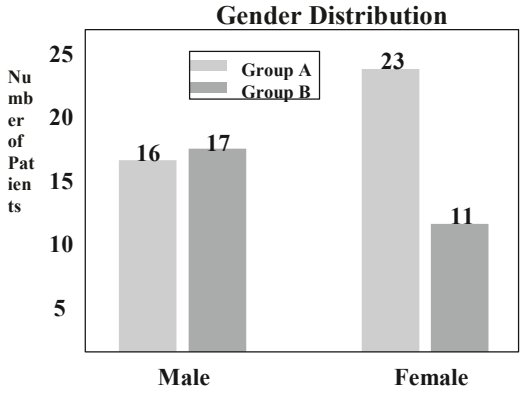

Figure 1: Gender Distribution Among Studied Patients

Gender distribution between two groups (A and B) among 67 patients. Males comprise 58.21% (16 in Group A, 23 in Group B), while females represent 41.79% (17 in Group A, 11 in Group B). The P-value of 0.141 indicates no statistically significant difference in gender distribution between the groups.

Table 2: Side of Affected Hand Between Two Groups

Side of Affected Hand	Number of Patients (n=67)	Percentage (%)	Group A (n=33)	Group B (n=34)	P-Value
Dominant Hand	60	89.55	31	29	0.427
Non Dominant Hand	7	10.45	2	5	

*Statistical Test: Chi-square test (χ^2)

The table shows the distribution of the side of the affected hand among patients. Most patients (89.55%) had their dominant hand affected, with 29 in Group A and 31 in Group B, showing no significant difference between groups. A smaller proportion (10.45%) had their non-dominant hand affected, with 2 in Group A and 5 in Group B and no significant difference (p=0.427). This indicates that lateral epicondylitis predominantly affects the dominant hand.

Table 3: Baseline VAS Scores Between Groups

Group	Mean VAS Score ± SD	P-value
Group A	7.08 ± 0.68	0 .867
Group B	7.05 ± 0.74	0.867

*Statistical Test: Independent samples t-test

The baseline Visual Analogue Scale (VAS) scores between the two groups. Group A had a mean VAS score of 7.08 ± 0.68, while Group B had a mean VAS score of 7.05 ± 0.74. The p-value of 0.867 indicates no significant difference between the baseline pain levels of the two groups, suggesting that both groups had comparable initial pain intensity before the intervention.

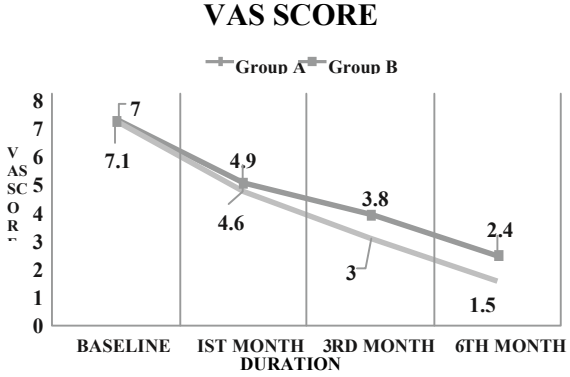

Figure 2: Line diagram showing the distribution of patients by VAS score

Shows the VAS scores of the patients of groups A and B. In group A, at the beginning of treatment, the mean VAS score of the patients was 7.1. The VAS score gradually decreased in 1st month (4.6), 3rd month (3.0) and 6th month (1.5). In group B, at the beginning of treatment, the mean VAS score of the patients was 7.0. The VAS score gradually decreased in 1st month (4.9), 3rd month (3.8) , and 6th month (2.4)

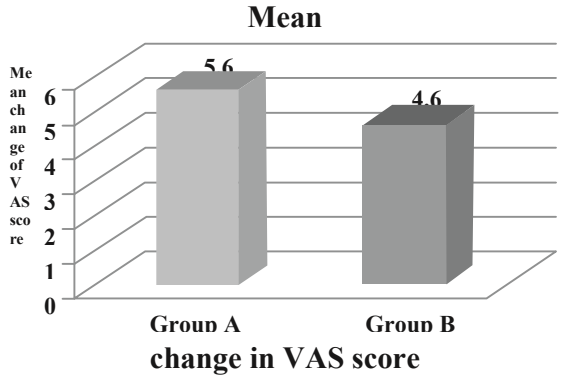

Figure 3: Mean change in VAS score in Group A and Group B

Shows the mean change in VAS score in two groups. In group A, the mean change in VAS score was more (5.6±0.7) than group B (4.6±1.01), respectively, which means that group A patients improved better comparison to group B patients in this study.

Table 4: Pre and Post-Intervention VAS Scores in Group A and Group B

Group	VAS Score Pre-Intervention (Mean ± SD)	VAS Score Post-Intervention (Mean ± SD)	P-Value
Group A	7.08 ± 0.68	1.51 ± 0.65	<0.001
Group A	7.05 ± 0.74	2.37 ± 0.79	<0.001

*Statistical Test: *Paired samples t-test* (within-group comparisons)

The table shows the pre and post-intervention Visual Analogue Scale (VAS) scores for Group A and Group B.
Group A's mean VAS score improved significantly from 7.08 ± 0.68 pre-intervention to 1.51 ± 0.65 post-intervention, with a p-value of <0.001. Similarly,
Group B's mean VAS score improved significantly from
7.05 ± 0.74 pre-intervention to 2.37 ± 0.79 post-intervention, with a p-value of <0.001. Both groups exhibited significant reductions in VAS scores, indicating substantial pain relief, with Group A showing a more significant improvement.

Table 5: Baseline PRTEE Scores Between Groups

Group	Mean PRTEE Score ± SD	P-value
Group A	49.23 ± 10.51	0 .459
Group B	50.61 ± 9.17	0.459

*Statistical Test: *Independent samples t-test*

The baseline Patient-Rated Tennis Elbow Evaluation (PRTEE) scores between the two groups. Group A had a mean PRTEE score of 49.23 ± 10.51, while Group B had a mean PRTEE score of 50.61 ± 9.17. The p-value of 0.459 indicates no significant difference between the baseline PRTEE scores of the two groups, suggesting that both groups had similar pain and functional impairment levels before the intervention.

Table 6: Pre and Post-Intervention PRTEE Scores in Group A and Group B

Group	PRTEE Score Pre-Intervention (Mean ± SD)	PRTEE Score Post-Intervention (Mean ± SD)	P-Value
Group A	49.23 ± 10.51	19.85 ± 6.90	<0.001
Group A	50.61 ± 9.17	24.57 ± 7.96	<0.001

*Statistical Test: *Paired samples t-test* (within-group comparisons)

The table shows the pre and post-intervention PRTEE scores for Group A and Group B. Group A's mean PRTEE score improved from 49.23 ± 10.51 pre-intervention to 19.85 ± 6.90 post-intervention, with a p-value of <0.001, indicating a significant improvement. Group B's mean PRTEE score improved from 50.61 ± 9.17 pre-intervention to 24.57 ± 7.96 post-intervention, with a p-value of <0.001, indicating a significant improvement. Both groups showed significant reductions in PRTEE scores, with Group A showing a more significant improvement.

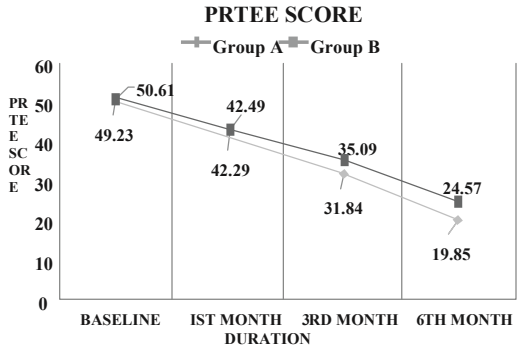

Figure 4: Line diagram showing the distribution of patients by PRTEE score

Shows the PRTEE scores of the patients of groups A and B. In group A, at the beginning of

treatment, the mean PRTEE score of the patients was 49.23. The PRTEE score gradually decreased in 1st month (42.29), 3rd month (31.84) and 6th month (19.85). In group B, at the beginning of treatment, the mean PRTEE score of the patients was 50.61. The PRTEE score gradually decreased in 1st month (42.49), 3rd month (35.09) and 6 thmonth (24.57).

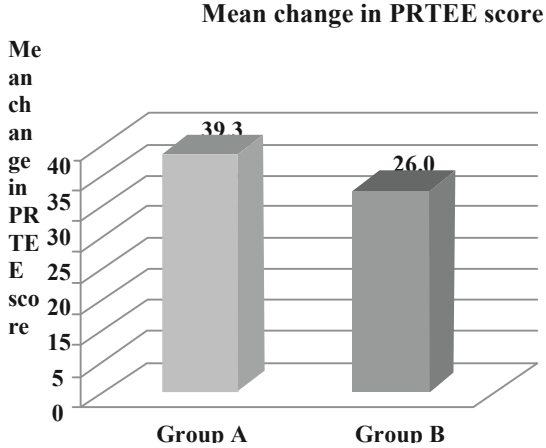

Figure 5: Mean change in PRTEE score in Group A and Group B

Shows the mean change in PRTEE score in two groups. In group A, the mean change in PRTEE total score was more (39.3±10.1) than group B (26±7.1) respectively, which means that group A patients improved better compared to group B patients in this study.

Discussion:

Lateral epicondylitis, commonly known as tennis elbow, is one of the most perplexing musculoskeletal disorder. It frequently affects individuals aged 30 to 50, leading to significant disability in daily activities.[10,11] The condition arises from repetitive manual work that overexerts the wrist and finger extensors. The functional disability in lateral epicondylitis stems from decreased collagen synthesis during the healing phases, resulting in fibrous, scar-like tendon tissue. This interferes with the normal function of muscles, causing impaired grip and restricted daily activity.

Autologous PRP was first used to avoid excessive transfusion of homologous blood products following open-heart surgery.[12] Since then, autologous PRP has been documented as a safe and effective treatment in various fields, including orthopedics, sports medicine, dentistry, ENT, neurosurgery, ophthalmology, urology, and more. Studies suggest that PRP can positively affect inflammation and soft tissue healing due to the abundance of growth factors and cytokines released after platelet degranulation, essential for soft tissue healing and bone mineralization.[13] PRP has gained popularity as an autologous therapeutic agent for various tendinopathies, including lateral epicondylitis. The present study aimed to evaluate the outcome of PRP injections in treating lateral epicondylitis, focusing on pain reduction and functional improvement.

The age range of study participants was 28 to 65 years, with no significant age difference between the groups. It was found that lateral epicondylitis is prevalent among patients aged 45-54, while reported a broader age range of 18-60 years.[14] This variation might be due to different predisposing factors, such as mechanical overloading and overuse. The present study found no significant gender differences between the groups, which is consistent with the findings. Occupational studies showed that lateral epicondylitis is most common among individuals involved in repetitive forearm movements. Excessive, monotonous use of wrist extensors and forearm supinators was identified as the primary cause of lateral epicondylitis.[15]In the current study, about half of the patients in both groups were homemakers and day laborers. The prevalence of lateral epicondylitis among housewives can be attributed to their involvement in various household activities requiring extensive use of forearm supinators and wrist extensors. The dominant hand was affected in most patients, consistent with other studies. A study evaluating hand dominance in common hand disorders found lateral epicondylitis is more common on the dominant side.

Physical therapy is commonly prescribed for lateral epicondylitis, focusing on increasing forearm strength, flexibility, endurance, and muscle stretching. Recently, eccentric exercises have been shown to reduce symptoms effectively. Adding eccentric exercises improved pain, strength, and overall functional scores.

Additionally, elbow braces reduce forces on the common extensor tendon, decreasing pain during extensor muscle contraction activities.[16]In the current study, patients in group B who received elbow braces and eccentric exercises showed a gradual decrease in mean VAS scores from 7.0 to 2.4, likely due to the combined effect of these treatments.

Pain was measured using the VAS scale. In group A, patients' mean VAS scores decreased from 7.1 at baseline to 1.5 at the 6th month. This improvement is similar to the results reported.[17]). Significant symptom improvement was also found in 60% of patients treated with PRP compared to 16% treated with bupivacaine. Several studies have compared the efficacy of PRP with corticosteroids or saline.[18] Found that both PRP and autologous blood injections reduced pain, but no significant difference existed between the treatments. Conducted a network meta-analysis of injection therapies for lateral epicondylitis and found a limited but statistically significant effect of PRP compared to placebo. However, no study has compared PRP with management, including orthosis, exercise, ADLs, and paracetamol, until now. The current study found that VAS scores were significantly lower in the PRP group compared to group B. Pain reduction was also noted in the control group, likely due to the effect of home exercise programs, orthosis, and paracetamol. However, the multifactorial nature of pain reduction suggests that the exact mechanisms remain unclear.

The PRTEE total score, reflecting both pain and functional improvement, showed significant improvement in both groups ($p<0.001$). In group A, the mean PRTEE score decreased from 49.23 to 19.85, and in group B, it decreased from 50.61 to 29.56 after six months reported similar findings.[19] The long-lasting effect of platelets may be due to their ability to improve early neo-tendon properties, enabling cells to respond to mechanical loading early. In the sixth month, significant statistical differences were found between the groups, with lower PRTEE scores in group A. This contrasts with Krogh et al., who found no significant difference among PRP, saline, and corticosteroid injections concerning PRTEE scores at three months.[20]

No post-injection complications were reported in the present study, except for one patient who experienced pain at the injection site, which was managed with an ice pack.

Conclusion:

PRP injection is an effective method for treating tendinopathy like lateral epicondylitis. Although both treatments offered in this study have shown significant improvement of pain, PRP injection provided sustain pain relief and better outcome regarding physical function.

To complement the clinical parameters that may be used to designate successful treatment, addressing the current lack of radiologic (and histologic) documentation of the response to PRP therapy is recommended.

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