

Original Research Article

Assessment of clinical and functional outcomes after single dose injection of autologous platelet rich plasma in patients with chronic lateral epicondylitis: a prospective and brief follow up study

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ABSTRACT

Background: Lateral epicondylitis is a chronic, painful, and debilitating elbow condition. The introduction of platelet-rich plasma as an adjunct to the conservative and operative treatment has revolutionized the research in this topic. PRP is considered to be the ideal autologous biological blood-derived product which helps in regenerating the degenerated tissue rather than just repairing it and helps in relieving pain and improving function.

Methods: This is a prospective study where 40 patients diagnosed with tennis elbow, failing other conservative treatment modalities were enrolled; and treated with single dose injection of autologous PRP; and were evaluated for clinical and functional outcomes using the visual analogue scale and disabilities of arm, shoulder, and hand scores on the follow-ups.

Results: Out of the 40 patients enrolled, there were 15 males and 25 females. The mean age of the population was 45.88 ± 8.87 years. All the patients had improved statistically significant differences in mean VAS and DASH scores (p value < 0.001) on each follow-up as compared to the baseline score with VAS score and DASH score improvement being more than 77% and 65% respectively at final follow up.

Conclusion: Our study concludes that a single local injection of autologous PRP appears to be the promising and safe modality of treatment in lateral epicondylitis, helping to improve the pain as well as the clinical and functional outcomes.

Keywords: Platelet-rich plasma, Tennis elbow, Visual analog scale, Disabilities of shoulder arm and hand

INTRODUCTION

Lateral epicondylitis also most popularly known as tennis elbow is one of the most prevalent chronic, painful, and debilitating elbow conditions accounting for around 1-3% of the overall population with slightly more prevalence in women. It is more commonly seen at around 30-50 years of age. This condition is most common in workers whose activities require strong gripping, wrist movements, and

frequent rotation of the forearm; affecting most commonly the dominant limb.¹⁻⁵ This repetitive overuse (micro-trauma) leads to micro tears in the substance of the tendon and when the tolerable limit to stretch and repair is lost leads to the formation of immature repair tissue and abnormal microvascular reactions leading to angiofibroblastic degeneration and collagen array of the common extensor origin at the lateral epicondyle as confirmed on histological studies.⁶⁻⁹ Nirschl proposed the

primary involvement of the tendon of extensor carpi radialisbrevis (ECRB) in the disease and coined the term ‘Angiofibroblastic tendinosis’.⁸⁻⁹ However, studies have shown that the deep surface of the extensor carpi radialislongus (ECRL) and the anteromedial surface of the extensor digitorumcommunis (EDC) may also be involved in the disease process. Recent studies by Ljung et al showed that the origin fibers of ECRB contained an increased concentration of substance-P and calcitonin gene-related peptide (CGRP), which could be the cause of neurogenic inflammation and perceived pain.¹⁰ Rest, activity modification, non-steroidal anti-inflammatory drugs (NSAIDs), braces, physiotherapy, laser management, ultrasound treatment, extracorporeal shockwave treatment, botulinum toxin type A injection, and steroid injection are some of the practiced conservative modalities of treatment for tennis elbow.¹¹⁻¹⁴

The introduction of platelet-rich plasma (PRP) injection has motivated the conservative treatment modality for tennis elbow.¹⁵ PRP is considered to be the ideal autologous biological blood-derived product that can be applied exogenously to various tissues, where it enhances wound, tendon, and bone healing.¹⁶ Platelets in PRP on activation by the thrombin and collagen release various bioactive growth factors such as vascular endothelial growth factor (VEGF), transforming growth factor (TGF-B1), platelet-derived growth factor (PDGF), fibroblast growth factor (FGF), insulin-like growth factor (IGF) at the injection site; which play an important role in attracting undifferentiated cells at the newly formed matrix and triggers cell division and helps wound healing.¹⁷⁻¹⁹ Platelets themselves act as tissue sealant while the fibrin matrix acts as a drug delivery system thus helping repair process.²⁰⁻²¹ PRP also inhibits the release of inflammatory markers from macrophages thus reducing inflammation and helping tissue regeneration and healing, new capillary growth, and accelerate epithelialization in chronic wounds.²²⁻²³ Platelets in PRP have strong antibacterial properties and thus help in preventing infections.²⁴ Apart from tennis elbow, PRP has also found its use in various other orthopedic conditions like patellar tendinopathy, Achilles tendinopathy, shoulder impingement syndrome, rotator cuff tears, osteoarthritis knee and avascular necrosis of femoral head.²⁵⁻³¹

Aim and objectives

Aim and objective of current study was to assess the clinical and functional outcomes of a brief follow-up study after a single dose of autologous platelet-rich plasma injection for lateral epicondylitis.

METHODS

This is a prospective study conducted in the Department of Orthopaedics, Bharatratna Doctor Babasaheb Ambedkar Municipal Hospital, Mumbai from May 2021 to May 2023; wherein after the approval from the institutional ethical committee, 40 patients diagnosed with tennis elbow

were enrolled in the study. All the patients who failed initial treatment with NSAIDs and physiotherapy were enrolled and were treated with a single dose of autologous PRP injection and were evaluated with visual analog score (VAS) and disability of arm shoulder and hand (DASH). In all the patients, NSAIDs were avoided 1 week prior to the injection. All patients were asked to get routine blood investigations like complete blood count (CBC), clotting time (CT), bleeding time (BT), and triple H (HIV, HBsAg, HCV). Data was then collected by verbal communication and evaluation of clinical and functional outcomes was done with VAS and DASH scores.

Inclusion criteria

Pain and tenderness over the lateral epicondyle for more than 6 months, which increases on deep palpation; with one of the tests for tennis elbow positive: wrist extension test (Cozen’s test), Mill’s maneuver, broom or stir-frying test; were included in the study.

Exclusion criteria

Patients with anemia, thrombocytopenia, pregnancy, rheumatoid arthritis, fibromyalgia, local malignancy, or any previous surgery on the ipsilateral elbow; local steroid injection in past 3 months; patients on anti diabetic, anti hypertensive and anticoagulation medications; and patients with radiculopathy symptoms in the ipsilateral limb were excluded from the study.

Preparation of PRP

20cc of venous blood was collected and was transferred in equal amounts into two centrifuge tubes (10cc each) pre-added with anticoagulant 5% acid citrate dextrose. PRP was prepared by two spin methods. 1st spin (soft spin) was at 1800 rpm for 15mins which gave 3 layers, an upper layer of plasma platelets and a few WBCs, an intermediate layer or buffy coat layer composed of WBCs, and a bottom layer of RBCs. The upper layer was transferred to another tube and subjected to a second spin (hard spin) at 3500 rpm for 15 mins which gave 2 layers, the upper layer of platelet-poor plasma which was discarded, and the lower layer of platelet-rich plasma that was used. Around 3-4 ml of PRP was obtained. No exogenous factors were used for the activation of platelets.

Procedure

The entire procedure was done on an outpatient basis. After obtaining 3-4ml of PRP, the area of maximum tenderness on the lateral epicondyle was palpated and anesthetized with a local anesthetic drug (2% xylocaine) under sterile conditions. PRP was then injected using the ‘peppering technique’ in a clockwise manner to have better cover of the area. The patient was then observed for 20-30 minutes and then discharged with a crepe bandage around the elbow. The patient was asked not to involve in any sporting activities for 3 days and was given broad-

spectrum oral antibiotics to prevent any infection and advised a combination of paracetamol and tramadol (325 mg + 37.5 mg) and cold fomentation for pain relief. After 3 days the bandage was removed and was asked to do normal routine activities. Painkillers were advised to be discontinued after 3-5 days of injection.

Follow up protocol

Patients were followed up at 4 weeks, 8 weeks, 12 weeks, and then at 24 weeks post-injection. Clinical and functional outcomes were evaluated with VAS and DASH scores and compared with pre-injection status. If there was no improvement in the status at 4 weeks post-procedure, repeat injection was advised atleast two times with a gap of 4 weeks. If no improvement was observed even after 24 weeks of the last injection, surgery was advised.

Statistical analysis

All the data was collected in Microsoft excel spreadsheet. The nominal data (such as gender and side) was expressed as number. The continuous data (such as age, VAS scores and DASH scores) was expressed as mean, standard deviation and range. Comparison for significance was done by paired student t test. A p value of <0.05 was considered statistically significant.

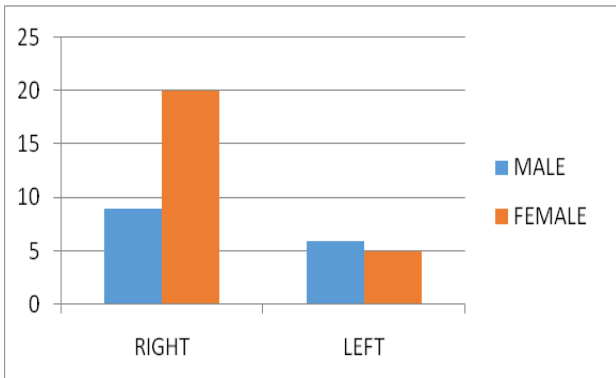


Figure 1: Demographic distribution of the study population.

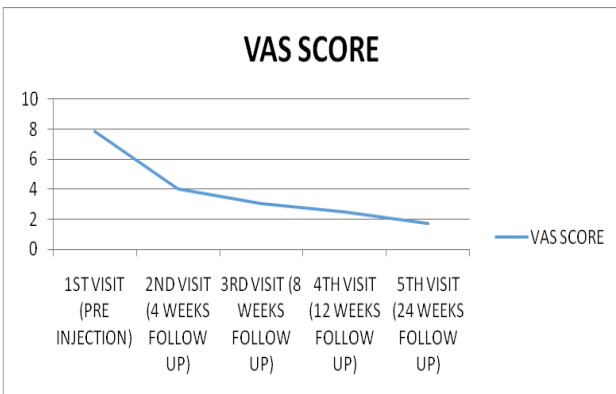


Figure 2: Mean VAS (visual analog scale) scores at different time frames.

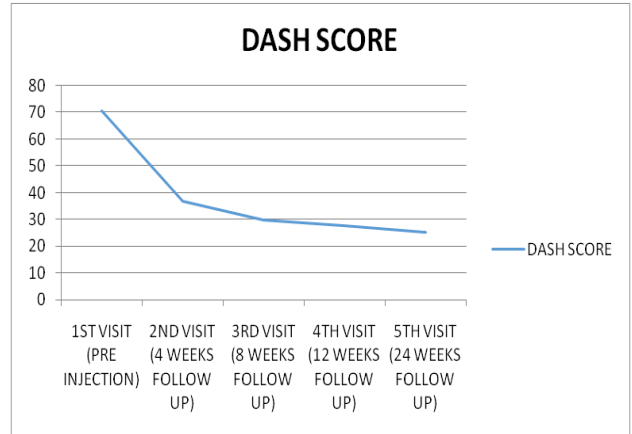


Figure 3: Mean DASH (disabilities of arm, shoulder and hand) scores at different time frames.

Table 1: Mean VAS and DASH scores at pre injection and post injection (4th, 8th, 12th and 24th week) time frames.

Time frame (weeks)	VAS score	DASH score
Pre-injection	7.85±1.02	70.38±10.76
4 th	4.025±1.35	36.75±13.42
8 th	3.05±0.49	29.88±3.88
12 th	2.5±0.54	27.63±3.39
24 th	1.75±0.52	25.3±3.74

RESULTS

Out of the total 40 patients enrolled in the study, there were 15 male and 25 female patients. All patients had dominant elbow involvement. Out of 15 male patients, 6 had left-sided and 9 had right-sided involvement; while out of 25 female patients, 5 had left-sided and 20 had right-sided involvement. The mean age of the study population was 45.88±8.87 years with the range being 30-62 years. The (Table 1) shows the mean VAS and DASH scores of the patients during their first visit (pre-injection) and at 4 weeks, 8 weeks, 12 weeks, and 24 weeks post-injection. Highly significant results were observed between the scores at the first visit and then at subsequent visits. There were 3 patients who did not have successful results after the 1st injection (<50% improvement in the scores). In these patients repeat injection was done after a month and later on, results were found to be successful. No complications related to the injection were observed during the study period.

DISCUSSION

Lateral epicondylitis is a condition characterized by abnormal microvascular reactions leading to angiofibroblastic degeneration and collagen array of the common extensor origin at the lateral epicondyle.⁶⁻⁹ The current study shows that local injection of PRP is a very good treatment modality in these patients, helping to relieve pain and improving function. It is considered to be the safer option when compared to local steroid injections.

No activation agent was used. The activation of the platelets occurred through exposure to the thrombin produced as a reaction at the site of injection and exposed collagen.

On activation, platelets in the PRP release various growth factors which have neotendon properties and also help in tissue healing by enhancing cellular chemotaxis, proliferation, and differentiation, removal of the inflammatory and cellular debris, enhancing angiogenesis, and laying down new extracellular matrix.¹⁶⁻¹⁹ It also inhibits the release of various inflammatory markers from macrophages and thus helps in tissue healing.²²⁻²³ The clot so formed has various cell adhesion molecules like fibronectin, fibrin, and vitronectin which act as a scaffold for the delivery of these platelets and help in enhancing the biological activity of the platelets³². In addition, PRP also has antimicrobial properties and thus prevents infections.²⁴

The results of our study are in agreement with the study conducted by Mishra et al who observed significant improvement in the symptoms (p value < 0.001) after 8 weeks and 24 weeks treated with PRP injection; with success rate being 93% while that with corticosteroid injection being 65%.^{32,33} A study conducted by Peerbooms et al reported 24 out of 49 patients (49%) in the corticosteroid group and 37 out of 51 patients (73%) in the PRP group had successful results. In the same study when DASH scores were compared; 25 out of 49 patients (51%) in the corticosteroid and 37 out of 5 patients (73%) in the PRP group had significantly better results.³⁴ A study conducted by Gosen et al compared the clinical and functional outcomes in tennis elbow between the autologous PRP and corticosteroid injection groups.³⁵ It was found that the corticosteroid group initially had better results, but later on, the outcomes showed regression. While the PRP group showed gradual improvement in both pain reduction and clinical and functional outcomes over a period of time. As per the study by Niemiee et al patients with autologous PRP injection had significantly improved results in terms of VAS, DASH, PRTEE, and MAYO scores between baseline and post-injection values.³⁶ This is in agreement with findings of our study. However, there were a few limitations in our study.

Firstly, there was no control group to compare. Second, we did not make use of ultrasound guidance to administer the injections, hence we were not able to judge the dimension of the pre-procedure tear, failing to establish the guidelines as far as the dose of injection is concerned. Third, we did not measure the pre and post-centrifuge platelet concentration, again no standardization of the dose to be administered. Lastly, our study had a smaller sample size. However, there were little strengths in our study. The follow up protocol of our study was minimum 24 weeks post injection which was decided to look for any regression of initial favorable results and any long standing local as well as systemic complications associated with local PRP injection. Also, we did not have any loss of follow ups in this study throughout the period of 24 weeks.

CONCLUSION

Current study concludes that a single local injection of autologous PRP appears to be the promising and safe modality of treatment in lateral epicondylitis, helping to improve the pain as well as the clinical and functional outcomes. It is both safe (avoiding the complications of surgery) and cost-effective modality to treat patients suffering from tennis elbow without any regression of results on follow-up. However, in order to establish alternative, beneficial, cost-effective, and safer long-term effects of local injection of autologous PRP injection on clinical and functional outcomes, we need some more studies with much longer follow-up periods and larger populations.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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