

---

# INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN BIOLOGY AND MEDICINE

ISSN: 2455-944X

[www.darshanpublishers.com](http://www.darshanpublishers.com)Volume 3, Issue 10 - 2018

---

## Original Research Article

DOI: <http://dx.doi.org/10.22192/ijcrbm.2018.03.10.001>

## Platelet Rich Plasma: A treatment Modality In Tennis Elbow

### Dr. Kushal Aggarwal

Intern, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar

E-mail: [ambitiouskushal@yahoo.com](mailto:ambitiouskushal@yahoo.com)

### Dr. Seerat Sandhu

Intern, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar

E-mail: [seeratsandhu2206@gmail.com](mailto:seeratsandhu2206@gmail.com)

### Dr. Aditya Bhardwaj

Assistant Professor, Orthopedics, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar

E-mail: [dradityabhardwaj@gmail.com](mailto:dradityabhardwaj@gmail.com)

---

### Abstract

---

#### Objective:

To determine the efficacy and advantages of Platelet Rich Plasma injection over Autologous whole blood and steroid in the treatment of Tennis elbow (Lateral Epicondylitis).

#### Methods:

The study was a randomised study conducted in the department of Orthopedics at Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab.

#### Results:

Platelet Rich Plasma injections proved to be more efficacious as compared to Autologous Whole Blood and Steroid injections.

**Keywords:** Platelet Rich Plasma; Autologous whole blood ; Steroids ; Lateral Epicondylitis.

---

### Introduction

Lateral epicondylitis known as tennis elbow is a repetitive strain injury caused by repetitive overuse of the extensor muscles of the wrist. It is the most frequent type of myotendinosis occurring more specifically at the common extensor tendon that originates from the lateral epicondyle [1, 2]. The frequency of lateral epicondylitis is reported between 1 to 3% among normal nonathlete population [3].

Epicondylitis was initially believed to be an inflammatory process but in 1979, it was described as the disorganization of normal collagen architecture by

invading fibroblasts in association with an immature vascular reparative response, which termed it as "angiofibroblastic hyperplasia" [1, 2]. This injury predominantly involves the origin of the short radial extensor muscle of the carpus, in which microtears develop as a result of excessive and abnormal use, with formation of immature repair tissue. Histologic findings in chronic cases confirm that tendinosis is not an acute inflammatory condition but rather a failure of the normal tendon repair mechanism associated with angiofibroblastic degeneration [1-3]. Current research has produced several biological hypotheses regarding

the cause of tendinosis based on histopathological, biochemical, and clinical findings that show cell apoptosis, angiofibroblastic features, or abnormal biochemical adaptations, largely suggesting that a failed healing response underlies the condition [4]. It causes pain and functional impairment in daily activities [2, 3]. The treatment of this condition includes conservative therapy and surgical interventions [3, 4]. The effectiveness of oral nonsteroidal anti-inflammatory agents, topical and injectable medications including corticosteroids and botulinum toxins, splinting, physical therapy, and iontophoresis has been evaluated in many studies [4]. However, these traditional therapies do not alter the tendon's inherent poor healing properties secondary to poor vascularization [5, 6]. Given the inherent nature of the tendon, new treatment options including platelets rich plasma (PRP), autologous blood, and prolotherapy are aimed at inducing inflammation rather than suppressing it [7–9]. Two different preparations that are most described in the literature are autologous whole blood (AB) and platelet-rich plasma (PRP) injection [5, 10, 12, 14, 19, 21, 23]. PRP is quite a new treatment used for chronic tendinitis [4]. Platelet rich plasma is defined as a volume of the plasma fraction of autologous blood having a platelet concentration above baseline [6]. Both PRP and autologous blood contain platelets, and these platelets have strong growth factors and granules that have critical role in the healing process of chronic injuries [7, 8]. Due to higher concentration of platelets in PRP than whole blood, it was shown to have greater effect in the repair process in treatment of chronic nonhealing tendinopathies including tennis elbow [4, 8, 9]. Therapeutic PRP should have a platelet concentration 4 to 6 times greater than that of whole blood (200000/mm<sup>3</sup>). The concentrations less than or greater than this amount may be ineffective or inversely lead to suppression of the healing process [4, 6, 7]. Known platelet growth factors stimulate the healing process and lead to partial modification of the damaged tissue [9-11]. The net results of PRP therapy in chronic tendinopathies are varied and hypothesized to include angiogenesis, increase in growth factor expression and cell proliferation, increase the recruitment of repair cells also, tensile strength [9,10]. Due to higher concentration of platelets in PRP than whole blood, it was suggested in some studies to have greater effect in the healing and repair process [12,13]. Various results have been published about applications of PRP in different fields such as skin and hair, ENT, orthopaedics etc. [14,15]. PRP use has also been evaluated in musculoskeletal disorders such as

muscular injuries, achille and lateral epicondyle tendinopathies with satisfactory results [8,12]. Some studies have shown that local injection of autologous whole blood has greater therapeutic effect than steroid injection in treating tennis elbow [5, 10, 11]; also there are studies showing the greater efficacy of local autologous PRP than corticosteroids in treating this disorder [4, 8]. However, only a few studies have been conducted to compare the efficacy of these two treatments. Considering the high cost of autologous PRP therapy and lack of a study comparing autologous whole blood versus PRP injection objectively, this study was designed to evaluate the efficacy of autologous whole blood injection as a less costly treatment versus PRP in patients suffering from chronic lateral epicondylitis.

## Methodology

The study was a randomised control trial and was carried in the Department of Orthopedics in Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab.

### Patients and Setting:

All patients with clinical signs and symptoms of chronic lateral epicondylitis during April 2018–October 2018 presenting in the department were considered to be a part of the study.

### Inclusion Criteria:

Criteria for inclusion in the study were chronic clinically diagnosed lateral epicondylitis (based on symptoms, site of tenderness, and pain elicited with resisted active extension of the wrist in pronation and elbow extension); with duration of symptoms more than 3 months and pain severity with minimum score of 5 (based on 10 scale Visual Analogue Score (VAS)).

### Exclusion Criteria:

Patients were excluded if they were pregnant, older than 75 years, had history of trauma, any platelet dysfunction syndrome (Critical thrombocytopenia), any other coagulopathies (such as hypofibrinogenemia), local infection at the site of the procedure, any recent febrile or infectious disease, consistent use of NSAIDs within 48 hours before procedure, recent use of corticosteroids during last 2 weeks, a history of local injection of any medications (steroid, whole blood, PRP, or dry needling) into the

site of lateral epicondyle, hemoglobin <10 gr/dL, plasma platelets count <100000 mm<sup>3</sup>, history of any malignancy (including hematologic and non-hematologic malignancies), carpal tunnel syndrome, cervical radiculopathy or peripheral radial nerve injury, systemic illnesses including ischemic heart disease, diabetes, rheumatoid arthritis, hepatitis, any bony malformations, bony or articular lesions at elbow (diagnosed by radiographic imaging), a history of vasovagal syncope, or hemodynamic instability.

### **Ethical Considerations:**

From the ethical point of view, all patients gave written consent for inclusion in the study. The process of the treatment was simplified and explained to the patients and only after the patients completely understood the study protocol and became aware of their rights during the study, the written consent form was signed by the patients. The institutional review board of Sri Guru Ram Das Institute of Medical Sciences and Research approved the protocol of this study. The process of treatment had no harm for their health, and they had authority to stop the process of treatment.

In case of very rare incidence of side effects associated with PRP or autologous blood injection (persistent pain and swelling, infection and fibrosis, or any neuromuscular complications at injection site) or steroids patients had access to the project's incharge in order to contact him if they encountered any of the possible adverse reactions to injection.

### **Randomization and patients' enrollment:**

The block covariate adaptive randomization method is designed to randomize subjects into the treatment groups. This led to equal sample sizes within each group and balance of the important covariates. Thus, a new participant is sequentially assigned to particular treatment groups by taking into account the specific matched covariates and previous assignments of participants.

### **Intervention:**

#### **Group 1 (Autologous Platelet Rich Plasma (PRP) group):**

The treatment protocol for patients in this group was a single injection of 2 mL of autologous PRP, deep at the origin of wrist extensors, into maximal tenderness

point at elbow region under aseptic technique. The patient was placed in an appropriate and comfortable position that allowed for sterility and access to the site of injection. The skin of the injection site was prepped and draped and the liquid PRP was injected in a sterile condition using a 18 G needle. The patient received a PRP injection at maximal point at elbow using a peppering technique spreading in a clock-like manner to achieve a more expansive zone of delivery.

#### **Group 2 (Autologous whole blood):**

The treatment protocol in this group included a single injection of 2 mL of autologous peripheral whole blood under the same technique as the PRP group. Two ml of lidocaine 1% was injected 8 minutes before PRP or whole blood injection for patients in both groups.

#### **Group 3 (Corticosteroid):**

The treatment modality in this group included a single injection of 2ml of corticosterone under the same technique as the preceding 2 groups.

No cortisone or nonsteroidal anti-inflammatories were prescribed during follow-up. For pain relief only, oral paracetamol and ice therapy were used. Patients of all the 3 groups were requested to refrain from heavy labor activities for a week. Tennis elbow strap was administered for all patients and they were instructed to apply the strap 2 centimetres below the maximal tenderness point at elbow. The patients were followed via weekly telephone calls and instructed how to use elbow splint and perform exercises. Three days after the injection, each patient was asked to start a simple program of extensor muscles stretching and 2 weeks after injection eccentric loading exercises were prescribed to be performed on an individual basis twice every day for 5 weeks. The patients were allowed to perform full activities of daily living after 4 weeks.

### **Parameters used to measure results:**

**Pain Intensity:** Pain severity was evaluated before injection and re-evaluation was done at 4 and 8 weeks, after the injection. Visual Analog Scale Analog Pain Score (VAS) (range, 0 [no pain] to 10 [agonizing pain]) was used.

**Modified Mayo Clinic Performance Index:** “Modified Mayo Clinic performance index” for the elbow was used as a valid and reliable measure to evaluate the functional improvement after therapy(15). The Mayo Clinic performance index for the elbow has 4 parameters: pain, motion, stability, and daily function. The maximum score is 100 and the minimum index is 0; the results are interpreted as excellent (90), good (75–89), fair (60–74), and poor (<60). The pain parameters in this questionnaire carries the highest points which is 45 out of 100 [16]. The modified mayo questionnaire was very specific to changes in elbow function. The questions were found to be reliable, reproducible and sensitive to change in elbow function [15]. Its construct validity is good for patient-rated variables and excellent for physician-

rated variables. Mayo questionnaire was filled out via interviewing each patient before and after therapy.

**Statistical Analysis:** Computer software SPSS-16 was used for data analysis.

## Results

In this study, 70 patients were initially out which 5 were excluded and eventually 60 patients completed the study. The mean age of patients was  $35 \pm 2$  years old. 32 patients were females (53.3%) and 28 patients were male (46.7%). 53 patients were right handed while 7 were left handed. The mean duration of symptoms in all 3 groups was  $9 \pm 3$  months.

Males	28		
Females	32		
Platelet Rich Plasma Injection	20		
Autologous Whole Blood Injection	20		
Corticosteroid Injection	20		

### PRP Characteristics:

The mean platelets count of all patients at baseline was  $220000/\text{mm}^3 \pm 23000$ , which increased to  $990000 \pm 43000$  (4.5 times) in PRP preparation.

### Outcome Measures:

All outcomes including VAS and Mayo scores were measured before intervention, then they were measured 4 and 8 weeks after initiating therapy in each group.

### VAS Score :

#### Post intervention (4-Week Followup):

Mean VAS score decreased significantly in all 3 groups.

**Post intervention (8-Week Followup):** Mean VAS score decreased significantly compared to 4 week only

in PRP group. VAS score did not change significantly compared to 4 week follow up at 8 week follow up in AWB group and corticosteroid group.

### Mayo Score:

#### Post intervention (4-Week Followup):

Mayo score improved significantly in all 3 groups.

#### Post intervention (8-Week Followup):

Mayo score improved significantly compared to 4-week followup only in PRP group. However, the change in Mayo score compared to 4-week followup was not significant in AWB group and corticosteroid group at 8-week followup.

Therefore, at 8-week evaluations, pain improvement according to VAS and Mayo scores remained significant only in PRP group.

## Discussion

The natural history of tennis elbow has been shown to be self-limiting in the majority of sufferers, with most recovering within 1 year with conservative management. The most effective treatment for chronic lateral epicondylitis, however, is argued amongst experts. There are numerous studies suggesting successful outcomes with physiotherapy for acute cases, with up to 90 % resolution. Previously, cases that persisted despite physiotherapy had been treated with corticosteroid injections. Steroid injections were reported to give short-term pain relief, however the proven recurrence rates and complications (including dermal depigmentation, subcutaneous atrophy, and a theoretical risk of increased tendon rupture) should limit their use.

This led to further research in order to identify new treatment modalities like Autologous Whole Blood and Platelet Rich Plasma injections. Studies started being conducted to compare the efficacies of Autologous Blood and Platelet Rich Plasma.

According to the results of our study, local injection of PRP and autologous whole blood into lateral epicondyle both led to significant improvement in subjective (Visual Analog Score) at 4 weeks of followup. Improvement in functional score was also noted according to Mayo score.

However, at 8 weeks of follow up significant improvement was seen only in the PRP group. The exact mechanisms by which PRP initiates cellular and tissue changes are presently being investigated [6]. There is enough laboratory evidence of PRP effect on tendon healing [7]. It has been considered in some studies that platelet growth factors could be effective in the cartilage healing process in knee osteoarthritis [8]. PRP can stimulate processes associated with tendon healing. The proposed mechanism of action is the elicitation of a healing response in the damaged tendons by growth factors present in the blood [6]. These growth factors trigger stem cell recruitment, increase local vascularity, and directly stimulate the production of collagen by tendon sheath fibroblasts. Increased production of endogenous growth factors has been found in human tendons treated with PRP [3, 7, 9].

## Conclusion

PRP and autologous whole blood injections and steroid injections are all effective methods to treat chronic lateral epicondylitis. However, at 8-week followup, PRP treatment seems to be a more effective treatment with more persistent efficacy than autologous blood and steroids in relieving pain and improving function.

Because PRP and whole blood are autologous and are prepared at the point of care, they have an excellent safety profile.

The limitation of our study was the relatively small number of cases included, absence of a control group receiving no intervention, and short-term follow-up evaluations. More number of Randomised Control Trials need to be done to investigate the efficacy, timing and dose of injections.

## References

- [1] M.A. Childress and A. Beutler, "Management of chronic tendon injuries," *American Family Physician*, vol. 87, pp. 486–490, 2013.
- [2] A. O. Chourasia, K. A. Buhr, D. P. Rabago et al., "Relationships between biomechanics, tendon pathology, and function in individuals with lateral epicondylitis," *Journal of Orthopaedic & Sports Physical Therapy*, vol. 43, pp. 368–378, 2013.
- [3] A. Mishra and T. Pavelko, "Treatment of chronic elbow tendinosis with buffered platelet-rich plasma," *American Journal of Sports Medicine*, vol. 34, no. 11, pp. 1774–1778, 2006.
- [4] J. C. Peerbooms, J. Sluimer, D. J. Bruijn, and T. Gosens, "Positive effect of an autologous platelet concentrate in lateral epicondylitis in a double-blind randomized controlled trial: platelet-rich plasma versus corticosteroid injection with a 1-year follow-up," *American Journal of Sports Medicine*, vol. 38, no. 2, pp. 255–262, 2010.
- [5] A. M. Boonstra, H. R. Schiphorst Preuper, M. F. Reneman, J. B. Posthumus, and R. E. Stewart, "Reliability and validity of the visual analogue scale for disability in patients with chronic musculoskeletal pain," *International Journal of Rehabilitation Research*, vol. 31, no. 2, pp. 165–169, 2008.



- [6] R. S. Dhillon, E. M. Schwarz, and M. D. Maloney, "Platelet-rich plasma therapy—future or trend?" *Arthritis Research & Therapy*, vol. 14, p. 219, 2012.
- [7] S. A. Raeissadat, S. M. Rayegani, M. Babaei, and E. Ghorbani, "The effect of platelet-rich plasma on pain, function, and quality of life of patients with knee osteoarthritis," *Pain Research and Treatment*, vol. 2013, Article ID 165967, 7 pages, 2013.
- [8] E. Kon and G. Filardo, "PRP or not PRP? That is the question," *Knee Surgery, Sports Traumatology, Arthroscopy*, vol. 19, no. 6, pp. 870–871, 2011.
- [9] R. R. Monto, "Platelet rich plasma treatment for chronic Achilles tendinosis," *Foot & Ankle International*, vol. 33, pp. 379–385, 2012.
- [10] T. Gosens, B. L. Den Oudsten, E. Fievez, P. van 't Spijker, and A. Fievez, "Pain and activity levels before and after platelet-rich plasma injection treatment of patellar tendinopathy: a prospective cohort study and the influence of previous treatments," *International Orthopaedics*, vol. 36, no. 9, pp. 1941–1946, 2012.
- [11] Edwards SG, Calandruccio JH (2003) Autologous blood injections for refractory lateral epicondylitis. *J Hand Surg Am* 28(2):272–278
- [12] Egger M, Davey Smith G, Schneider M, Minder C (1997) Bias in meta-analysis detected by a simple, graphical test. *BMJ* 315(7109):629–634
- [13] Gosens T, Peerbooms JC, Van Laar W, Den Oudsten BL (2011) Ongoing positive effect of platelet-rich plasma versus corticosteroid injection in lateral epicondylitis: a double-blind randomized controlled trial with 2 year follow-up. *Am J Sports Med* 39(6):1200–1208
- [14] Kannus P, Jozsa L (1991) Histopathological changes preceding spontaneous rupture of a tendon. A controlled study of 891 patients. *J Bone Joint Surg Am* 73(10):1507–1525
- [15] Kazemi M, Azma K, Tavana B, Rezaiee Moghaddam F, Panahi A (2010) Autologous blood versus corticosteroid local injection in the short-term treatment of lateral elbow tendinopathy: a randomized clinical trial of efficacy. *Am J Phys Med Rehabil* 89(8):660–667
- [16] Krogh TP, Bartels EM, Ellingsen T, Stengaard-Pedersen K, Buchbinder R, Fredberg U, Bliddal H, Christensen R (2013) Comparative effectiveness of injection therapies in lateral epicondylitis: a systematic review and network meta-analysis of randomized controlled trials. *Am J Sports Med* 41(6):1435–1446
- [17] Krogh TP, Fredberg U, Stengaard-Pedersen K, Christensen R, Jensen P, Ellingsen T (2013) Treatment of lateral epicondylitis with platelet-rich plasma, glucocorticoid, or saline: a randomized, double-blind, placebo-controlled trial. *Am J Sports Med* 41(3):625–635
- [18] Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, Clarke M, Devereaux PJ, Kleijnen J, Moher D (2009) The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *PLoS Med* 6(7):e1000100
- [19] Song F, Altman DG, Glenn AM, Deeks JJ (2003) Validity of indirect comparison for estimating efficacy of competing interventions: empirical evidence from published meta-analyses. *BMJ* 326(7387):472
- [20] Song F, Harvey I, Lilford R (2008) Adjusted indirect comparison may be less biased than direct comparison for evaluating new pharmaceutical interventions. *J Clin Epidemiol* 61(5):455–463
- [21] Stata/SE 11.0 for windows (32bit). 13 July 2009 (updated 13 July 2009; cited). (13 July 2009)
- [22] Thanasis C, Papadimitriou G, Charalambidis C, Paraskevopoulos I, Papanikolaou A (2011) Platelet-rich plasma versus autologous whole blood for the treatment of chronic lateral elbow epicondylitis: a randomized controlled clinical trial. *Am J Sports Med* 39(10):2130–2134
- [23] Verhaar JA (1994) Tennis elbow. Anatomical, epidemiological and therapeutic aspects. *Int Orthop* 18(5):263–267
- [24] Lim W, Park SH, Kim B, Kang SW, Lee JW, Moon YL. Relationship of cytokine levels and clinical effect on platelet-rich plasma-treated lateral epicondylitis. *J Orthop Res*. 2018 Mar;36(3):913-920. doi: 10.1002/jor.23714. Epub 2017 Sep 20. PMID: 28851099
- [25] Mi, Bobin. Platelet rich plasma versus steroid on lateral epicondylitis: meta-analysis of randomized clinical trials. *The Physician and Sportsmedicine* 2017; 45(2):97-104.
- [26] Colombo GV, Fanton V, Sosa D, Criado Scholz E, Lotti J, Aragona SE, et al. Use of platelet rich plasma in human infertility. *J Biol Regul Homeost Agents*. 2017;31(2 Suppl. 2):179–182. [PubMed]
- [27] Zadehmodarres S, Salehpour S, Saharkhiz N, Nazari L. Treatment of thin endometrium with autologous platelet-rich plasma: a pilot study. *JBRA Assist Reprod*. 2017;21:54–56. [PMC free article] [PubMed]

- [28] Ghodasra, J.H., Wang, D., Jayakar, R.G. et al. The assessment of quality, accuracy, and readability of online educational resources for platelet-rich plasma (PRP). *Arthroscopy*. 2018; 34: 272–278
- [29] Kelly, F.B. **Platelet-Rich Plasma (PRP)**. (Published 2011. Accessed August 29, 2018) <http://orthoinfo.aaos.org/topic.cfm?topic=A00648>
- [30] Kelly, F.B. **Platelet-Rich Plasma (PRP)**. (Published 2011. Accessed August 29, 2018) <http://orthoinfo.aaos.org/topic.cfm?topic=A00648>

Access this Article in Online	
	Website: <a href="http://www.darshanpublishers.com">www.darshanpublishers.com</a>
	Subject: Medical Sciences
Quick Response Code	

How to cite this article:

Kushal Aggarwal, Seerat Sandhu, Aditya Bhardwaj. (2018). Platelet Rich Plasma: A treatment Modality In Tennis Elbow. *Int. J. Curr. Res. Biol. Med.* 3(10): 1-7.

DOI: <http://dx.doi.org/10.22192/ijcrbm.2018.03.10.001>