ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 15, Issue 11, 2022

Online - 2455-3891
Print - 0974-2441

Research Article

ROLE OF PLATELET-RICH PLASMA INJECTIONS IN TENNIS ELBOW; A PROSPECTIVE STUDY

NITIN CHOUDHARY, AKHIL GUPTA*, SANJEEV GUPTA, NEERAJ MAHAJAN

Department of Orthopaedics, Government Medical College, Jammu, Jammu and Kashmir, India. Email: nitchy700@gmail.com

Received: 16 June 2022, Revised and Accepted: 30 July 2022

ABSTRACT

Objectives: The aim of this study is to evaluate the efficacy of platelet-rich plasma (PRP) injections in chronic/recalcitrant cases of lateral epicondylitis in comparison to steroid injections and their role in averting surgical procedures.

Methods: A prospective study was carried out in the Post Graduate Department of Orthopaedics, Government Medical College and Hospital, Jammu, from July 21 to June 22.

Results: The patients managed with PRP injections tend to have a better outcome in long-term follow-up than the steroid group and the results in our study have been found to be statistically significant ($p<0.05$).

Conclusion: We consider PRP injection for intractable lateral epicondylitis of the elbow, not only a safe but also very effective tool in reducing symptoms as well as averting the need for surgical intervention in this difficult cohort of patients.

Keywords: Tennis elbow, Lateral epicondylitis, platelet-rich plasma injection, Steroid injection, Visual analog score, Disabilities of arm, shoulder and hand score.

 DOI: http://dx.doi.org/10.22159/ajpcr.2022v15i11.45565. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

Lateral epicondylitis (tennis elbow*)*, a familiar term used to describe myriad symptoms around the lateral aspect of the elbow, occurs more frequently in non-athletes than athletes, with a peak incidence in the early fifth decade and has a nearly equal gender incidence. Lateral epicondylitis can occur during activities that require repetitive supination and pronation of the forearm with the elbow in near full extension. Runge first described the clinical entity in 1873, and since then almost 30 different conditions have been proposed as causes. Recent studies have suggested that some individuals may have a genetic predisposition to develop tennis elbow. Although originally described as an inflammatory process, the current consensus is that lateral epicondylitis is initiated as a microtear, most often within the origin of the extensor carpi radialis brevis. Microscopic findings show immature reparative tissue that resembles angiofibroblastic hyperplasia. The pathologic process mainly involves the origin of the extensor carpi radialis brevis but can involve the tendons of the extensor carpi radialis longus and the extensor digitorumcommunis.

The introduction of platelet rich plasma (PRP) as a possible adjunct to conservative and operative treatment has motivated significant research into this topic [1]. PRP is promoted as an ideal autologous biological blood-derived product that can be exogenously applied to various tissues where it releases high concentrations of platelet-derived growth factors (PDGF) that enhance wound, bone, and tendon healing [2]. Platelets present in PRP function as a tissue sealant, initiating wound repair [3]. Whereas fibrin matrix acts as a drug delivery system slowly releasing various platelet-derived bioactive factors [4] such as vascular endothelial growth factor (VEGF), transforming growth factor -β1, insulin-like growth factor, and PDGF [5,6], PRP platelets are initially activated by thrombin and collagen, releasing growth factors that attract undifferentiated cells into the newly formed matrix and trigger cell division [7]. PRP can inhibit cytokine release from macrophages, improving tissue healing and regeneration by limiting the inflammation [8], can promote new capillary growth [9], and can accelerate epithelialization [4] in chronic wounds. PRP has found its application in various orthopedic conditions such as tendinopathies (i.e., lateral epicondylitis [2,8,10-12], patellar tendinopathy, Achilles tendinopathy, shoulder impingement syndrome, rotator cuff tear, osteoarthritis knee, and avascular necrosis of femoral head).

METHODS

The study was a prospective study conducted from July 2021 to June 2022.

Patients with signs and symptoms of chronic lateral epicondylitis not responding to conservative management such as oral medication, tennis elbow belt, physiotherapy, aged between 18 and 60 years were included in our study.

Exclusion criteria

The following criteria were excluded from the study:

1. Patients with history of anemia (hemoglobin <7.0 g/dL)
2. Thrombocytopenia (platelets $<150\times10^3$ μL)
3. Pregnancy
4. Local malignancy
5. Rheumatoid disease and previous surgery or elbow dislocation
6. Diabetes mellitus.

Thirty subjects were included in our study and were divided into two random groups with 15 subjects in each group.

Written informed consent was taken from all the patients participating in the study. PRP was prepared using double spin centrifugation method. 20 ml of venous blood is drawn from cubital vein. The blood is immediately transferred into six 2.7 ml vacutainers prefilled with acid citrate dextrose. All the containers are filled till the markings on the vacutainers. The vacutainers are then placed in the slot available in the centrifugation machine in such a way that they are counter balanced. The initial centrifuge will be done at 1500 rotations/min for 3 min. This separates the blood into two layers. RBC rich at the bottom and plasma along with the platelets is at the top. The top layer is then transferred to fresh vacutainers using a long 18 G needle and syringe. The vacutainers are now again centrifuged at 2500 rotations/min for 3 min. This separates the column of plasma to platelet rich at the bottom and

platelet poor at the top. Using along 18 G the top half column which is platelet poor is discarded. The PRP at the bottom is now collected from the vacutainers and is now ready for use. The patients in the PRP group were given 2 mL of PRP prepared from autologous blood at the most tender point over the lateral epicondyle and were repeated after 4 weeks.

The patients in the steroid group received a single dose of 2 mL of methylprednisolone (40 mg/mL, injection tricot). Patients were rested for 15 min after injection and advised not to massage.

In both groups, patients were prescribed a combination of tramadol and paracetamol (37.5 mg+325 mg) tablets for pain for 3–5 days following injection. Patients were assessed using a 10-point visual analog score (VAS) for pain and disabilities of arm, shoulder, and hand scale (DASH) score before and after the treatment at 2, 6 weeks and 3, 6 months.

RESULTS

There was no statistical difference in the age of these groups. Mean age group was 38.1±9.3 years in PRP group and 40.4±8.15 years in steroid group. The incidence of females was higher in both groups than males (Table 1).

The values of VAS and DASH were taken at regular intervals of 2, 6 weeks and 3, 6 months as mentioned above for both groups.

As seen in the results above (Tables 2 and 3), we can see that there are significant improvements in symptoms of patients of both groups till 6 weeks with steroid having better values than the other group, however, with time, the effect of steroid begins to deplete and PRP continues to show improvement in results continuously with values being statistically significant in both groups, that is, ≤0.05 for both VAS as well as DASH Scores. Figs. 1 and 2 also show that with both techniques' patients fare good for up to 6 weeks; however, at and above 3 months, the lines crossover depicting that the effect of steroid wares off while PRP group shows continuous improvement over a long follow-up.

Table 1: Sociodemographic features of participants of both groups

Characteristics	PRP group	Steriod group	p-value
Age	38.1±9.3	40.4±8.15	0.38
Duration of symptoms	6 (4–12)	6 (4–7)	0.37
Gender			
Male	6	7	-
Female	9	8	-

PRP: Platelet-rich plasma

Table 2: VAS scores for both groups

Time	Steroid group	PRP group	p-value
At presentation	4.85±1.09	4.60±0.94	-
2 weeks	1.60±1.03	3.10±0.79	
6 weeks	0.85±0.45	2.15±0.81	
3 months	1.80±1.1	1.05±0.81	
6 months	2.65±1.0	0.55±0.69	0.02

PRP: Platelet-rich plasma

Table 3: DASH scores for both groups

Time	Steroid group	PRP group	p-value
At presentation	53.69±5.62	57.64±6.34	-
2 weeks	30.82±3.01	47.30±6.45	
6 weeks	25.90±1.79	38.26±4.94	
3 months	31.79±1.67	29.95±2.65	
6 months	34.06±1.55	23.26±1.48	0.03

PRP: Platelet-rich plasma, DASH: Disabilities of arm, shoulder and hand scale

DISCUSSION

Lateral epicondylitis will continue to be a relatively common disorder with a significant health burden [13]. CS injection used to be the treatment of choice for LE. CS suppresses the immune system by suppressing the pro-inflammatory proteins. Its potential side effects include lipodystrophy, skin pigmentation changes, and tendon atrophy/ruptures. PRP is an increasingly popular treatment for LE.

Our results are consistent with studies done by Peerbooms *et al.* [10] and Hastie *et al.* [14] showing the efficacy of PRP. PRP increases expression of the collagen gene and production of VEGF and hepatocyte growth factor in human tenocytes [14,15], and Type-I collagen [16]. PRP initially inhibits the inflammatory process and then stimulates proliferation and maturation of the healing process. It enhances stromal and mesenchymal stem cell proliferation [17] and prevents the fibrous scar tissue healing that occurs with macrophage-mediated tendon-to-bone healing [18]. PRP may also suppress macrophage proliferation and interleukin-1 production within the first 72 h [16-19]. PRP injection is superior to CS injection for chronic LE as proven in our results which have also been proved in the past in studies conducted by Hastie *et al.* [14], Krogh *et al.* [20], Hardy *et al.* [21]. Ultrasonography revealed a decrease in thickness of the tendon after CS injection and an increase in thickness after PRP injection [22]. The recurrence rate and need for repeated injection or surgery are higher in the CS than PRP group [21-23].

CONCLUSION

We conclude that PRP injections have better results than local steroid injections and help in averting surgical procedures in chronic/recalcitrant cases of lateral epicondylitis.

DECLARATION OF PATIENT CONSENT

Well informed consent was taken from all subjects included in our study.

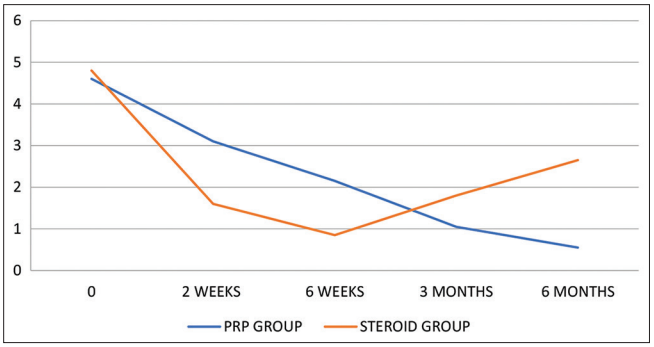

Fig. 1: VAS score for both groups over time

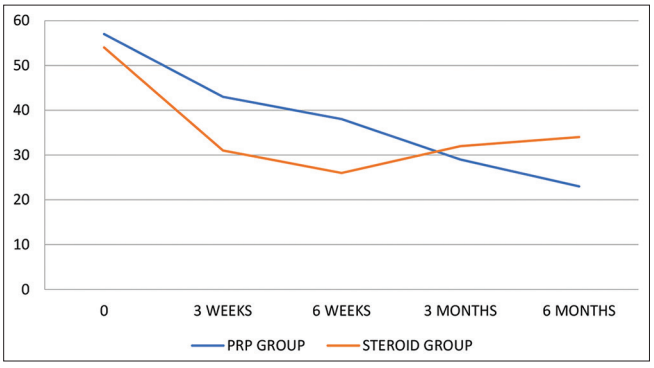

Fig. 2: Dash score for both groups over time

AUTHOR'S CONTRIBUTION

All the authors have contributed to the study design. The authors declare that they have no competing interests.

CONFLICTS OF INTEREST

There are no conflicts of interest.

SOURCE OF FUNDING

None.

REFERENCES

1. Geaney LE, Arciero RA, DeBerardino TM, Mazzocca AD. The effects of platelet-rich plasma on tendon and ligament: Basic science and clinical application. Oper Tech Sportsmed 2011;19:160-4. doi: 10.1053/j.otsm.2011.04.001
2. Edwards SG, Calandruccio JH. Autologous blood injections for refractory lateral epicondylitis. J Hand Surg Am 2003;28:272-8. doi: 10.1053/jhsu.2003.50041, PMID 12671860
3. Eppley BL, Woodell JE, Higgins J. Platelet quantification and growth factor analysis from platelet-rich plasma: Implications for wound healing. Plast Reconstr Surg 2004;114:1502-8. doi: 10.1097/01.prs.0000138251.07040.51, PMID 15509939
4. Everts PA, Knape JT, Weibrich G, Schönberger JP, Hoffmann J, Overdevest EP, *et al*. Platelet-rich plasma and platelet gel: A review. J Extra Corpor Technol 2006;38:174-87. PMID 16921694
5. Weibrich G, Kleis WK, Hafner G, Hitzler WE. Growth factor levels in platelet-rich plasma and correlations with donor age, sex, and platelet count. J Craniomaxillofac Surg 2002;30:97-102. doi: 10.1054/jcms.2002.0285, PMID 12069512
6. Landesberg R, Roy M, Glickman RS. Quantification of growth factor levels using a simplified method of platelet-rich plasma gel preparation. J Oral Maxillofac Surg 2000;58:297-300; discussion 300-1. doi: 10.1016/s0278-2391(00)90058-2, PMID 10716112
7. Bhanot S, Alex JC. Current applications of platelet gels in facial plastic surgery. Facial Plast Surg 2002;18:27-33. doi: 10.1055/s-2002-19824, PMID 11823930
8. Mishra A, Woodall J Jr., Vieira A. Treatment of tendon and muscle using platelet-rich plasma. Clin Sports Med 2009;28:113-25. doi: 10.1016/j.csm.2008.08.007, PMID 19064169
9. McAleer JP, Sharma S, Kaplan EM, Persich G. Use of autologous platelet concentrate in a nonhealing lower extremity wound. Adv Skin Wound Care 2006;19:354-63. doi: 10.1097/00129334-200609000-00010, PMID 16943701
10. Peerbooms JC, Sluimer J, Bruijn DJ, Gosens T. 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. Am J Sports Med 2010;38:255-62. doi: 10.1177/0363546509355445, PMID 20448192
11. Connell DA, Ali KE, Ahmad M, Lambert S, Corbett S, Curtis M. Ultrasound-guided autologous blood injection for tennis elbow. Skeletal Radiol 2006;35:371-7. doi: 10.1007/s00256-006-0081-9, PMID 16552606
12. Gani NU, Butt MF, Dhar SA, Farooq M, Mir MR, Kangu KA, *et al*. Autologous blood injection in the treatment of refractory tennis elbow. Internet J Orthop Surg 2007;5:54-73.
13. Sanders TL Jr., Kremers HM, Bryan AJ, Ransom JE, Smith J, Morrey BF. The epidemiology and health care burden of tennis elbow: A population-based study. Am J Sports Med 2015;43:1066-71. doi: 10.1177/0363546514568087, PMID 25656546
14. Hastie G, Soufi M, Wilson J, Roy B. Platelet rich plasma injections for lateral epicondylitis of the elbow reduce the need for surgical intervention. J Orthop 2018;15:239-41. doi: 10.1016/j.jor.2018.01.046, PMID 29657476
15. De Mos M, Van der Windt AE, Jahr H, Van Schie HT, Weinans H, Verhaar JA, *et al*. Can platelet-rich plasma enhance tendon repair? A cell culture study. Am J Sports Med 2008;36:1171-8. doi: 10.1177/0363546508314430, PMID 18326832
16. Kajikawa Y, Morihara T, Sakamoto H, Matsuda KI, Oshima Y, Yoshida A, *et al*. Platelet-rich plasma enhances the initial mobilization of circulation-derived cells for tendon healing. J Cell Physiol 2008;215:837-45. doi: 10.1002/jcp.21368, PMID 18181148
17. Woodall J Jr., Tucci M, Mishra A, Asfour A, Benghuzzi H. Cellular effects of platelet rich plasmainterleukin1 release from prp treated macrophages. Biomed Sci Instrum 2008;44:489-94. PMID 19141963
18. Lucarelli E, Beccheroni A, Donati D, Sangiorgi L, Cenacchi A, Del Vento AM, *et al*. Platelet-derived growth factors enhance proliferation of human stromal stem cells. Biomaterials 2003;24:3095-100. doi: 10.1016/s0142-9612(03)00114-5, PMID 12895582
19. Kawamura S, Ying L, Kim HJ, Dynybil C, Rodeo SA. Macrophages accumulate in the early phase of tendon-bone healing. J Orthop Res 2005;23:1425-32. doi: 10.1016/j.orthres.2005.01.014.1100230627, PMID 16111854
20. Krogh TP, Fredberg U, Stengaard-Pedersen K, Christensen R, Jensen P, Ellingsen T. Treatment of lateral epicondylitis with platelet-rich plasma, glucocorticoid, or saline: A randomized, double-blind, placebo-controlled trial. Am J Sports Med 2013;41:625-35. doi: 10.1177/0363546512472975, PMID 23328738
21. Hardy R, Tori A, Fuchs H, Larson T, Brand J, Monroe E. To improve pain and function, platelet-rich plasma injections may be an alternative to surgery for treating lateral epicondylitis: A systematic review. Arthroscopy 2021;37:3360-7. doi: 10.1016/j.arthro.2021.04.043, PMID 33957212
22. Mishra A, Collado H, Fredericson M. Platelet-rich plasma compared with corticosteroid injection for chronic lateral elbow tendinosis. PM R 2009;1:366-70. doi: 10.1016/j.pmrj.2009.02.010, PMID 19627920
23. Gosens T, Peerbooms JC, Van Laar W, Den Oudsten BL. 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 2011;39:1200-8. doi: 10.1177/0363546510397173, PMID 21422467.