Original Research Article

A prospective study of efficacy of autologous platelet rich plasma injection in tennis elbow

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Abstract

Aim: To study the efficacy of autologous platelet rich plasma in tennis elbow. **Materials and Methods:** This is a prospective trial involving the patients in the department of orthopedics, Melmaruvathuradhiparasakthi institute of medical college science hospital and Research Institute, GST Road, Melmaruvathur, Tamil Nadu, India. Prior consent was obtained from ethics committee for research in human beings before the study. A total of 50patients were included in this study. All the patients were selected based on the inclusion and exclusion criteria described. All the patients underwent same method of treatment. All the patients were assessed based on the numerical pain scoring system which will be described. **Results:** All the patients had similar form of treatment given that is single intralesional autologous PRP injection by peppering technique. Platelet rich plasma was prepared by a double centrifugation method initially at 1500 rotations per minute for 3 minutes and later at 2500 rotations per minute for 3 minutes. 2ml of PRP was obtained from 20ml of blood. This PRP was analyzed for cell count. The initial and 1,2,4,6 month's numerical pain score was recorded and analyzed. It was found that 77 percent of patients had significant relief of pain at two months which continued till the end of study. Pain relief in tennis elbow patients were analyzed separately and found 68 percent of tennis elbow patients had significant pain relief at two months and it continued till the end of study. **Conclusion:** Duration of symptoms to pain relief were analyzed and found no correlation. Finally it was concluded that intralesional autologous platelet rich plasma injection was safe and useful in the treatment of tennis elbow with maximum benefit observed at 2months.
Key Words:PRP, Tennis Elbow, Bone Grafting.

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INTRODUCTION

Over the past 3 decades, platelet rich plasma has gained increased importance in various medical fields, including orthopedics. Several studies have shown the use the use of platelet rich plasma in management of soft tissue and bony injuries. Recently, platelet plasma has been used for cartilage regeneration, chronic enthasopathies like tennis elbow and in the field of sports medicine.

The majority of orthopedic applications of platelet rich plasma will fall into 4 categories-

1. Chronic tendenopathies
2. Acute ligamentous injuries
3. Muscle injuries
4. Augmentation of other treatment modalities like bone grafting

Platelet rich plasma had a biological healing capacity. Platelet rich plasma helps in healing tennis elbow and recurrence rate will be low. In this study we used intralesional injection of autologous platelet rich plasma for the treatment of chronic tennis elbow.

MATERIAL AND METHODS

Recent local steroid injection. Infection or ulcer at the injection site. Rheumatoid arthritis. Sero negative

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spondylo arthritis. Pregnant ladies. Patients younger than 18 years. Suspicion of diagnosis

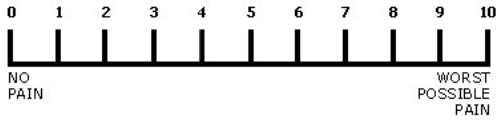
Informed consent was obtained from all the patients after explaining the disease condition and treatment with PRP injection in their local language. All the patients were informed about the study. All the patients agreed for the procedure and to participate in the study. All the patients and their nearest relative signed in the consent form.

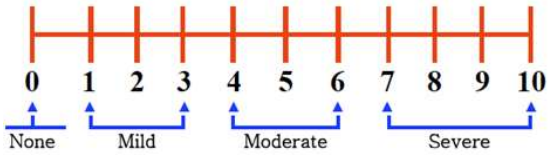
Inclusion Criteria: Patients with clinically diagnosed tennis elbow. Patients should have minimum three months duration of symptoms. Patients should underwent conservative treatment for a minimum period of three months. Patients should have pain score greater than seven at the time of PRP injection. Patients should not had a local steroid injection in last 2 months. Both sexes-males and female. Age- 18 years and above.

Exclusion Criteria: Less than 3 month duration of tennis elbow. Patients without any trial of conservative treatment.

Clinical Diagnosis: Diagnosis of tennis elbow was made when patient had pain in the lateral aspect of elbow joint. The pain would aggravate on wrist dorsiflexion. On examination the patient would have localized tenderness over lateral epicondyle.

Numerical Pain Score: Numerical pain score is a subjective assessment of pain, where the patient rates the intensity of the pain perceived. Score Zero refers to no pain. Score 10 refers to the worst pain possible. On the basis of numerical pain score, intensity of pain was divided in to mild, moderate and severe. Score zero to three was taken as mild, four to six as moderate and seven to ten as severe pain.





Follow Up

Patients were followed up for 6 months. A telephonic follow up was done at second day after injection to find out any adverse reactions. Follow ups was done at 1,2,4,6 months. Patients were assessed subjectively using the numerical pain score.

RESULTS AND ANALYSIS

Patients were analyzed for pain relief subjectively at 1, 2, 4 and 6 months. The results are given below.

Pain score was assessed at the time of injection. The mean pain score of all the patients was 8.614. The mean pain score at 1,2,4,6 months was 4.028, 2.57, 2.52 and 2.62 respectively. When individually analyzed mean pain score for tennis elbow at 0,1,2,4,6 months was 8,08,4.36,3.56,3.48,3.6 respectively. From the above data it can be concluded that patient get maximum relief of symptoms at two months and is sustained till at least 6 months.

Patients were analyzed for percentage reduction of pain. Percentage reduction of pain is obtained by calculating the percentage of the difference of pain score at every follow up from initial pain score at the time of injection. Out of the 50 patients 15 patients had 100 percent pain relief at one month and 30 patients at two months. This was sustained till the end of study. One patient had recurrence at four months. However77 percentages of patients had significant relief of pain (more than 50 percentage pain relief) at the end of two months, which was sustained till the end of study. 11 percentage patients did not benefit at all after the injection. 2 patients out of 50 had recurrence of pain in spite of early relief.

Table 1: percentage reduction of pain in total patients

	100 % Pain Relife	50-99 % Pain Relife	Less Than 50% Relife	0 % Pain Relife
1 Month Follow up	15(21.42%)	27(38.57%)	19(27.14%)	9(12.85%)
2 Month Follow up	30(42.86%)	24(34.286%)	8(11.43%)	8(11.43%)
4 Month Follow up	31(44.286%)	25(35.71)	6(8.57%)	8(11.43%)
6 Month Follow up	30(42.86%)	24(34.286%)	8(11.43%)	8(11.43%)

Table 2: percentage reduction of pain in tennis elbow patients

	100% Pain Relife	50-99% Pain Relife	Less Than 50% Pain Relife	0% Pain Relife
1 Month Follow up	5(20%)	8(32%)	7(28%)	5(20%)
2 Month Follow up	8(32%)	9(36%)	3(12%)	5(20%)
4 Month Follow up	9(36%)	8(32%)	3(12%)	5(20%)
6 Month Follow up	8(32%)	9(36%)	3(12%)	5(20%)

Analysis was done based on the duration of symptoms and ultimate pain relief. 16 out of the 35 patients with pain of less than 6 months, 9 out of 24 patients with duration of symptoms between 6-12 months and 5 out of 11 with symptoms of greater than one year had complete relief of pain. 2 out of 35 patients with pain less than 6 months, 4 out of 24 patients with pain for 6-12 months, and 2 out of 11 with pain greater than 1 year duration had no improvement of symptoms at six months (chart no-6). Duration of symptoms had no significant correlation with the clinical outcome after injection.

Chart number 4: pain reduction related to duration of symptoms in total patients

	100% PAIN RELIEF	50-99% PAIN RELIEF	LESS THAN 50% PAIN RELIEF	0% PAIN RELIEF
3-6 MONTHS	16(22.86%)	13(18.57%)	4(5.71%)	2(2.86%)
7-12 MONTHS	9(12.86%)	9(12.86%)	2(2.86%)	4(5.71%)
MORE THAN 1 YEAR	5(7.14%)	2(2.86%)	2(2.86%)	2(2.86%)

DISCUSSION

Platelet contains biologically active substance for blood clotting, such as coagulation factors, adhesive proteins and protease inhibitors. Platelets were also known to release growth factors like TGF –beta 1, CGF, VEGF, and PDGF. These growth factors are released once the platelets were activated. These growth factors initiates the process of tissue healing by cellular proliferation and differentiation, chemo taxis, tissue debris removal, angiogenesis, and extra cellular matrix formation [5]. These properties of tissue healing by platelets are used in treating degenerative enthasopathies like plantar fasciitis and tennis elbow by direct local injection of autologous platelet rich concentrate. Various techniques have been described for the preparation of autologous platelet rich plasma. They differ in duration and speed of centrifugation. The containers used for platelet rich plasma preparation also differ to minimize the direct handling of blood. The volume of platelet rich plasma usually comes about 10 percent of the whole blood used. Alsousou *et al* used a gps system for preparation of PRP. The prp volume of about 5 ml was collected following 12 minutes of rotations at 3200 rpm [5]. Augustus D *et al* used a double centrifugation method which separates blood first in to plasma and RBC. The plasma formed was separated again in to platelet rich plasma and platelet poor plasma by second centrifugation.[23] In this study Augustus D *et al* method of double centrifugation was used. By repeated trial and error method we standardized the procedure of preparation of platelet rich plasma. Platelet rich plasma is also known as platelet rich concentrate, autologous platelet gel or platelet releasate.[15] platelet rich plasma is defined as autologous blood with a concentration of platelets above the base line values. The platelet count in our samples ranged from two to six lakhs per cc. Hall m.p. *et al* described platelet rich plasma contains a two to eight fold increase in platelet concentration and 1-25 fold increase in growth factor concentration.[14] According to Marx R E *et al* in an article "what is prp and what is not PRP?" described that at least 10 lakhs of platelet per ml in five ml of plasma, will be associated with enhancement of healing. Alsousou J *et al* in a review article described a concentration of five times the normal count as working definition of PRP.[5] Growth factor concentration can be assessed by ELISA. Concentration of growth factors also depends on the method of preparation of prp. Augustus *et al* found that growth factors like HGF, IGF-1, and PDGF will be high in single centrifugation than in double centrifugation [23]. Since the assay of growth factors was not cost effective we did not do assay of growth factors. PRP can be divided in to low WBC PRP and high WBC PRP depending on WBC concentration. Augustus D *et al* found that WBC count is low in platelet poor plasma and high in platelet rich plasma.[23] They found that there were no significant difference in WBC cell types in platelet poor plasma and platelet rich plasma [23]. The concentration of WBC in prp was a subject of debate. Some authors recommended avoiding exposure of WBC to tissues so that inflammatory reaction may decrease. Bielecki T M *et al* support the WBC presence as it has antibacterial actions and increase in growth factor release[38]. Platelets in PRP get activated once they get released from circulation. Different techniques have been used by various authors for platelet activation. Kenneth s lee *et al* described that needle prick at the time of injection will induce bleeding which will provide the clotting factor thrombin need for activating platelets. Addition of substances like bovine thrombin, calcium chloride and type 1 collagen for activating platelets [18]. In this study Kenneth s lee *et al* technique of needling was used for platelet activation [19].Most of the authors used similar technique of infiltration for PRP treatment. Keith s Hetchman *et al*, Joost .c. Peerbooms *et al*, Ertugrul Aksahin *et al*, Ehab Mohammed selem Ragab *et al*, used similar technique. They palpated the point of maximum tenderness and injected by single skin portal and five to six penetrations in surrounding tissues. This technique was known as peppering technique. In this study we used same technique for injecting platelet rich plasma in Tennis elbow patients. This was a prospective trial by study design conducted on 50 patients 25 patients with tennis elbow. Both groups of patients were selected based

on the inclusion criteria and exclusion criteria described. Patients having chronic inflammatory conditions like rheumatoid arthritis are excluded from the study. Assessment of progression was done based on numerical pain scoring system. The following are some studies, investigated the efficacy of PRP on tennis elbow.. They compared the results with steroid injection by randomly selecting patients for PRP and steroid injections. The study population was 60 with 30 each patients got PRP and steroid injections. Ehab Following are some studies conducted on tennis elbow patients 1. Christos Thanases *et al* by comparing PRP to whole blood for tennis elbow[14] 2. Samuel A Taylor *et al* on 100 tennis elbow patients compared between PRP and steroid injection [11]. 3. Keith s Hetchman *et al* on 31 elbows which was not responded for conservative treatment by single PRP injection [13].While comparing the results at 1,2,4,6 months followup, it was found that patients got relief at one month. However the maximum relief of symptoms was at two months. The results obtained at two months sustained till the end of the study except in two patients. One patient with tennis elbow had recurrence of symptoms at four months.No patients had repeat injections. The above results were comparable with ErtugralAksahin *et al* and Christos Thanases *et al* study [2, 14]. The study of Christos Thanasas *et al* in tennis elbow the mean injection score was reduced from 6.1 to 2.35 at the end of 6 weeks, at 3 months 1.9 and 6 months 1.7. The difference between 1, 2, 4 and 6 months pain reduction were tested for significance by paired T – test using SPS system and found that there was no significant difference in pain reduction between 2 months and 4 months, 2 months and 6 months, 4 months and 6 months scores. But there was significant difference in pain score in 1 and 2 months. By testing independent samples T-test using equal variances assumed found that 2 months, 4 months and 6 months pain reduction was significantly equal in all groups.Duration of symptoms suggests the chronic nature of disease. In this study only 11 out of 50 patients had symptoms more than one year duration. 7 patients out of 11 had more than fifty percent pain relief compared to 18 patients out of 59 with less than one year duration. No studies are available to compare the chronicity of disease and outcome after PRP injection.

CONCLUSION

Intra lesional autologous PRP is a safe and useful modality of treatment in the treatment of tennis elbow. Following PRP injection results is better in tennis elbow Maximum benefit after PRP injection was observed at 2 months.

More trails are required to optimize the technique for separating platelet rich plasma.

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