

Tennis Elbow Managed by Corticosteroid and Platelet Rich Plasma (PRP): A Prospective Comparative Study

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ABSTRACT

Background: Platelet rich plasma (PRP) and corticosteroid injection have been suggested to treat tennis elbow patients. The aim of our study is to compare the outcome between corticosteroid and platelet rich plasma (PRP) for the management of tennis elbow.

Materials and Methods: 100 patients with lateral epicondylitis were randomly divided into two groups. Group A was treated with a single injection of 2 ml of corticosteroid mixed with 1 ml of xylocaine and Group B with 2 ml of PRP mixed with 1 ml of xylocaine. Pain and functional improvements were assessed using visual analogue scale (VAS) and Nirschl's staging at 0,2,4,8,16 and 32 weeks.

Results: Baseline (pre injection) clinical and demographic characteristics showed no difference between the two groups ($p>0.05$). Analysis done at 2 weeks showed no difference in Nirschl staging but showed significant decrease in VAS score favoring corticosteroid group. No significant difference was noted between the groups at 4 weeks (p value >0.05). At 8 weeks VAS score was comparable but Nirschl staging was significantly low in corticosteroid group. Evaluation done at 16 and 32 weeks demonstrated a statistically significant difference between groups favoring PRP group ($p<0.05$).

Conclusion: Both the PRP and corticosteroid are safe and effective in the management of lateral epicondylitis elbow. Steroids are effective for a short term period, whether on long term follow up; PRP seems to be more effective treatment.

Keywords: Lateral Epicondylitis, Platelet Rich Plasma (PRP), Corticosteroid, Nirschl's Staging, Visual Analogue Scale (VAS).

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Article History:

Received: 30-01-2018, **Revised:** 21-02-2018, **Accepted:** 28-03-2018

Access this article online

Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2018.4.2.051	

INTRODUCTION

Tennis elbow (lateral epicondylitis) is one of the most commonly encountered musculoskeletal entities in outpatient having an incidence of 4-7 per 1000 with a peak at 35-50 years.¹⁻³ The patient usually presents with pain over the elbow region and tenderness over the lateral epicondyle. On histopathology it is shown that lateral epicondylitis is not an inflammatory process but a degenerative condition.^{4,6}

Over use activities may be the cause of disease. There are various treatment methods conservative as well as operative. Conservative management includes activity modification, RICE regime (rest, ice compression, elevation) and Non-steroidal anti-inflammatory drugs. Conservative methods such as local corticosteroid injection works by suppressing inflammatory process that does not actually exists so Relapse and recurrence is higher, probably due to permanent adverse changes within the tendon and partially due to overuse of the arm after injection, as a result of direct pain relief. Platelet rich plasma (PRP) has been

promoted as biologic autologous blood derived product. PRP is defined as volume of the plasma fraction of autologous blood having a platelet concentration above baseline.⁶⁻⁸ It works by releasing of high concentrations of platelet derived growth factors (PDRF) occurs.^{9,10} These growth factors stimulate stem cell recruitment, increase local vascularity and directly stimulate the production of collagen by tendon sheath fibroblasts thus PRP enhances wound healing, bone healing and also tendon healing. The aim of our study is to compare the outcome between corticosteroid and platelet rich plasma (PRP) for the management of tennis elbow.

MATERIALS AND METHODS

100 adult patients attended the hospitals within the duration of June 2015 to April 2016 with the clinical diagnosis of lateral epicondylitis elbow were managed with platelet rich plasma (PRP) and corticosteroid, included in this study fulfilling inclusion criteria.

Inclusion Criteria

Patients aged 18 years or above of either sex with the clinical diagnosis of lateral epicondylitis elbow (site of pain and tenderness, pain elicited with active extension of wrist with forearm in pronation and elbow in extension).

Exclusion Criteria

Patients with history of acute elbow trauma, elbow arthritis, patients requiring anti-platelet medication for the treatment of ischemic heart disease, cerebrovascular accidents or other medical condition, any previous elbow surgeries, other causes of elbow pain such as Osteochondritis of capitulum, Posterior interosseous nerve syndrome, synovitis of radio humeral joint, cervical radiculopathy.

Procedure

Randomization was done by a computer based system (sealed envelope technique containing randomization coding)

Group A - Corticosteroid Group: 2 ml of local corticosteroid (Methyl prednisolone acetate 80 mg) mixed with 1 ml of 2% xylocaine, injected at the lateral epicondyle.

Group B - Platelet Rich Plasma (PRP) Group: 2 ml of freshly prepared PRP mixed with 1 ml of 2 % xylocaine, injected at the lateral epicondyle.

PRP Preparation: The patient was placed in a comfortable and appropriate position. 20 ml of blood was collected from the patient's opposite upper extremity cubital vein under aseptic precautions into four vacutainers containing anticoagulant. These four vacutainers were subjected to a first spin in a centrifuge at a speed of 2500 RPM for 10 minutes. After the First spin 3 layers appeared. The deep layer consists of red blood cells, the middle layer contains platelets and leukocytes, and the top layer is made up of plasma (less platelets). The top and middle layers were transferred to a fresh vacutainer and then subjected to a second spin at a speed of 3500 RPM for 15 minutes. The plasma at the bottom, which is rich in platelets, was used for infiltration.

Injection Technique

The elbow is flexed to 90° with forearm in pronation. Painting and draping was done. Radial head is palpated while pronating and supinating the forearm. The needle (22G) is introduced proximal to the radial head on lateral epicondyle at the point of maximum tenderness and the vicinity (around the tendon of ECRB), multiple

pricks were made in the tendon (peppering technique) and injected slowly. Patients were advised to give rest to the upper limb, avoid heavy activities for three days.

Figure 1: Injection technique (free hand technique)



Outcome Evaluation

Outcome was evaluated using visual analogue scale (VAS) and 'Nirschl staging of lateral epicondylitis.

Nirschl Staging

- Phase 1: Mild pain with exercise; resolves within 24hours.
- Phase 2: Pain after exercise; exceeds 48 hours.
- Phase 3: Pain with exercise; does not alter activity
- Phase 4: Pain with exercise; alter activity
- Phase 5: Pain with activities of daily living (heavy).
- Phase 6: Pain with activities of daily living (light), intermittent pain during rest also.
- Phase 7: Constant pain at rest, and sleep disturbance.

Statistical Analysis

Qualitative variables/Categorical variables were presented in number and percentage (%) and Quantitative variables/continuous variables were presented as mean ± SD. P value ≤0.05 was taken as a level of statistical significance. Further analysis was done by using chi-square test, ANOVA (Analysis of Variance) one way, ANOVA repeated measure, two ways ANOVA and paired t test if required. All analysis was done using SPSS software version 17.0.

Table 1: Baseline clinical and demographic characteristics (NS- non significant)

	Steroid	PRP	P value
Age (In Years)	47.10	45.30	0.1(NS)
Sex (Male: Female)	32:18	30:20	0.47(NS)
Laterality (Right: Left)	34:16	39:11	0.7(NS)
Mean duration of Symptoms (in weeks)	9.32	10.16	0.8(NS)
Mean VAS Score	5.46	5.78	0.2(NS)
Mean Nirschl Staging	4.8	5.20	0.4(NS)

Table 2: Change of VAS and Nirschl score in the steroid group during follow up.

Time	VAS				Nirschl Staging			
	Mean	SD	Median	P value	Mean	SD	Median	P value
0	5.46	1.8	6		4.8	1.8	5	
2 Weeks	4.40	1.4	5		3.98	1.4	4	
4Weeks	4.12	1.49	4		3.38	1.4	3.5	
8 Weeks	4.18	1.17	4	<0.0001	3.20	1.43	3	<0.0001
16 Weeks	4.96	1.38	5		4.20	1.58	4	
32 Weeks	4.34	1.15	4		3.68	1.26	3	

SD-Standard deviation; VAS-Visual Analog Scale

Table 3: Change of VAS and Nirschl Score in PRP group during follow up

PRP Group (50 patients)								
Time	VAS				Nirschl Staging			
	Mean	SD	Median	P value	Mean	SD	Median	P value
0	5.78	1.64	6		5.20	1.6	6	
2 Weeks	5.60	1.5	5.5		4.48	1.28	4.5	
4 Weeks	4.64	1.37	5		3.70	1.03	4	
8 Weeks	4.14	1.25	4	<0.0001	3.26	1.06	3	<0.0001
16 Weeks	3.86	1.46	4.00		3.16	1.43	3.00	
32 Weeks	3.48	0.97	3		2.78	1.27	2.5	

SD-Standard deviation; VAS-Visual Analog Scale, PRP -platelet Rich Plasma, p value<0.0001 –Significant.

RESULTS

In our study total 100 patients were included. Clinical evaluation of all the patients was done. Baseline VAS scores and Nirschl staging were recorded. Out of the 100 participants, 62 (62%) were males and 38 (38%) were females. In PRP group, 30 (60%) were males and 20 (40%) were females. In steroid group, 32 (64%) were males and 18 (36%) were females (p value =0.47). Thus, both the groups were comparable in terms of number of males and females in each group.

Age group encountered in the study ranged from 30 years to 72 years with a mean age of 46.20 years. Peak incidence at fourth decade of life was seen. The mean age of patients in PRP group was 45.30, and steroid group was 47.10 (p value =0.1). Thus age of patients in both the groups was comparable.

Baseline Characteristics

A Comparison of baseline demographic and clinical data in both the groups was done. Statistical analysis showed that that the difference between both the groups was not significant.

Corticosteroid Group: The mean VAS score before injection was 5.46. Similarly the mean values of Nirschl stage was 4.80. The mean value of VAS Score and Nirschl stage at different follow up visits are given in Table 2. The mean decrease observed in the

VAS score at the end of 32 weeks was statistically significant (p value <0.0001).

PRP Group: The mean VAS score before injection was 5.78. Similarly the mean value of Nirschl stage before administration of PRP was 5.20. The change in VAS score and Nirschl stage at different follow up visits are given in Table 3. The mean decrease observed in the VAS score and Nirschl stage at the end of 32 weeks was statistically significant (p value <0.0001).

Analysis between the Two Groups: After the initial analysis of two groups separately, comparison between the two groups was done. Pre injection mean VAS score and the mean value of Nirschl stage were comparable in both the groups. Statistical comparison between the two groups (Table 4) revealed that at 2 weeks VAS score was significantly lower in steroid group. At 4 and 8 weeks there was no significant difference between groups, however at 16 and 32 weeks significant difference was noted between groups favoring PRP group.

Similarly, Nirschl stage was compared. At 2 and 4 weeks there was no significant difference noted between the groups. At 8 weeks the mean value of Nirschl stage was comparable, however similar to VAS Scores, Nirschl staging was also significantly lower in PRP group at 16 and 32 weeks (Tables 5).

Table 4: VAS score comparison

	PRP			Steroid			P value
	Mean	SD	Median	Mean	SD	Median	
0	5.78	1.64	6	5.46	1.8	6	0.2
2 Weeks	5.60	1.5	5.5	4.40	1.4	5	<0.0001
4 Weeks	4.64	1.37	5	4.12	1.49	4	0.1
8 Weeks	4.14	1.25	4	4.18	1.17	4	0.7
16 Weeks	3.86	1.46	4	4.96	1.38	5	0.001
32 Weeks	3.48	0.97	3	4.34	1.15	4	0.001

Table 5: Nirschl stage comparison

	PRP			Steroid			P value
	Mean	SD	Median	Mean	SD	Median	
0	5.20	1.6	6	4.8	1.8	5	0.4
2 Weeks	4.48	1.28	4.5	3.98	1.4	4	0.2
4 Weeks	3.70	1.03	4	3.38	1.4	3.5	0.3
8 Weeks	3.26	1.06	3	3.20	1.43	3	0.04
16 Weeks	3.16	1.43	3	4.20	1.58	4	<0.0001
32 Weeks	2.78	1.27	2.5	3.68	1.26	3	<0.0001

DISCUSSION

Tennis elbow is a common problem encountered in orthopaedic practice. A large percentage of cases (70-80%) show resolution of their symptoms within a year with or without treatment.¹¹ Physiotherapy, activity modification and bracing are commonly recommended treatment and approximately 80-90% of patients

benefit from this combination of treatment methods.¹² The role of a local corticosteroid injection is debatable because pathology is non-inflammatory, so treatment with corticosteroids has a high frequency of relapse, and leads to permanent adverse changes within the structure of the tendon as patients tend to overuse the arm after injection (result of direct pain relief).¹³

Recently, autologous platelet rich plasma (PRP) has been reported to be effective for long term outcomes of the treatment of tennis elbow.¹⁴ PRP (platelet derived growth factor) promotes tendon healing. Some studies showed that platelet derived growth factors are also useful in cartilage healing in knee osteoarthritis.¹⁵ The proposed mechanism of action for PRP is the elicitation of a healing response in the damaged tendons by growth factors triggered 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 tendons treated with PRP.¹⁶

The results of our study shows that local injection of PRP and corticosteroid led to significant improvement in VAS and Nirschl staging at every follow up. There was no statistically significant difference between the groups regarding VAS at 4 and 8 weeks. Significant difference of VAS score between the groups was found at 2 weeks favoring steroid group and at 16, 32 weeks favoring PRP group. In our study comparison between two groups, showed that Nirschl staging comparable at 2, 4 weeks. At 8 weeks Nirschl staging in steroid group was significantly lower (p value <0.05). Significant difference of Nirschl staging between groups was found at 16, 32 weeks favoring PRP group.

Mishra et al evaluated treatment of chronic lateral epicondylitis with PRP. 8 weeks after the treatment Patients who had received PRP, noted 60% improvement in their VAS scores versus 16% improvement in control Patients.¹⁷ In a study PRP was compared to steroids in 30 patients of tennis elbow. Both VAS and DASH scores improved significantly in both groups after six weeks of treatment. While no significant differences were observed between both groups at six weeks which is in accordance to our present study.¹⁸ In a study of autologous blood was compared to steroid in treating 50 Tennis elbow Patients. Evaluation at 6 weeks demonstrated a significant decrease in pain levels and Nirschl staging in autologous blood group.¹⁹ Raeissadat SA et al evaluated treatment of lateral epicondylitis patient with PRP and autologous whole blood. At 4 weeks no statistically significant difference was noted between groups regarding VAS and Mayo scores, while statistically significant difference was noted at 8 weeks showing improvement in PRP group.²⁰ The beneficial effect of injection itself results from the bleeding caused by forcing fluid through tissue planes at high pressure.²¹

LIMITATIONS

In our study we used only subjective modes for evaluation of pain like VAS and Nirschl staging. The inclusion of an objective method of evaluation in the form of hand grip strength evaluation would have increased the strength of study. The concentration of platelets in PRP was not checked and standardized. We used free hand technique to give injection at lateral epicondyle. An ultrasound guided technique would have helped us in giving the injection precisely at the damaged tendon site. Since we included only those patients who were previously untreated, further studies are needed to detect any different in efficacy of PRP injection in cases of patients taken treatment with other modalities earlier.

CONCLUSION

PRP and corticosteroids both are safe and effective in the treatment of lateral epicondylitis elbow. Steroids are effective on a short term basis. However, on long term basis at 16 and 32 weeks

of follow up, PRP seems to be more effective than corticosteroid in relieving pain.

We encourage more randomized clinical trials on this topic specially emphasizing on the best technique of injection using ultrasound, number and frequency of injections and standardization of concentration of platelets in PRP.

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Source of Support: Nil.

Conflict of Interest: None Declared.

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Cite this article as: Mukesh Kumar Sharma, Ritesh Kumar. Tennis Elbow Managed by Corticosteroid and Platelet Rich Plasma (PRP): A Prospective Comparative Study. *Int J Med Res Prof*. 2018 Mar; 4(2):230-34. DOI:10.21276/ijmrp.2018.4.2.051