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A Study to Evaluate the Efficacy of Platelet Rich Plasma Injection in Patients of Chronic Lateral Epicondylitis

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Abstract

Background: Tennis elbow is a frequent cause of elbow pain and wrist dysfunction. The disorder develops insidiously and is usually related to repetitive and strenuous physical activity and stress, mostly applied to the origin of the extensor carpi radialis brevis.

Methods: This study was carried out prospectively on patients attending Out Patient Department, Sardar Patel Medical College, Bikaner with Chronic lateral epicondylitis between the age of 18-70 years of both male and female gender.

Results: In male patients grip strength has been improved from 14.29% to 95.24% following injection at the end of 6th months. In female patients grip strength has been improved from 26.32% to 84.21% following injection at the end of 6th months.

Conclusion: We conclude that PRP injection significantly decrease pain and increased elbow performance at 6 months follow-up. It is a effective treatment modality for the management of Tennis elbow.

Keywords: Lateral epicondylitis, platelet-rich plasma, tennis elbow.

Introduction

Tennis elbow (also known as “Lateral epicondylitis’’, “shooter’s elbow’’ and “archer’s elbow”) is a condition where the outer part of the elbow become sore and tender. It is a painful and debilitating condition, caused by angiofibroblastic hyperplasia of the tendinous origin of extensor carpi radialis brevis (ECRB) muscle. Any activity that involves repetitive twisting of the wrist (like using a screwdriver) can lead to this condition. Therefore, painters, plumbers, construction workers, cooks and butchers are all more likely to develop tennis elbow. This condition may also be due to constant computer keyboard and mouse use.

Tennis elbow is a frequent cause of elbow pain and wrist dysfunction. The disorder develops insidiously and is usually related to repetitive and strenuous physical activity and stress, mostly applied to the origin of the extensor carpi radialis brevis[1]. Sportspersons as well as those who used the same repetitive motion for many years, especially in their profession, suffer tennis elbow. Tennis elbow affects men and women equally, with a prevalence of 1%–3%[2] in general population.

Platelets, an important reservoir of growth factors in the body, play an important role in many processes such as coagulation, immune response, angiogenesis and the healing of damaged tissues. Numerous proteins are contained in the alpha-granules of platelets: platelet-derived growth factor, transforming growth factor, platelet factor interleukin, platelet-derived angiogenesis factor, vascular endothelial growth factor, epidermal growth factor, insulin-like growth factor and fibronectin.[3]Single or multiple injections of platelet-rich plasma (PRP) have been shown to be of significance in the management of tennis elbow.

Recently perposed treatment by PRP injection to surgical modalities including different procedures, such as release of the orbicular ligament, distal release of extensor muscle, lengthening of the extensor muscle of the wrist, or even simple percutaneous release of the common extensor origin(CEO) without removing any pathologic tissue, all have had reasonable success. So this study will be conducted to evaluate efficacy of platelet rich plasma injection in treatment of chronic lateral epicondilitis.

Materials & Methods

This study was carried out prospectively in the Department of Orthopaedics, Sardar Patel Medical College and Associate Group of Hospitals Bikaner.

Target Population

Patients attending Out Patient Department, Sardar Patel Medical College, Bikaner with Chronic lateral epicondylitis between the age of 18-70 years of both male and female gender.

Sample Size

A Total number of 40 patients were selected on O.P.D. basis and followed up to 6 months after there intervention starting from June 2016 after approval by ethical committee

Inclusion Criteria

- Patients with the age 18 years or older and consenting to study.
- Duration of symptoms for at least 3 months
- Pain over the common extensor origin increases with pressure over the lateral epicondyle and with resisted dorsiflexion of the wrist and or middle finger, for which no other cause could be identified.

Exclusion Criteria

- Patients with tendon rupture or post surgical tendon repairs.
- Patients with Active inflammatory disease.
- Patients with any recent febrile or infectious disease.
- Patients with history of any malignancy(including hematologic and non hematologic malignancies).
- Patients with history of autoimmune and platelet disorders, treatment with anticoagulant and anti platelet medications 10 days before injection.
- Patients with consistent use of NSAIDs within 48 hours before procedure, use of systemic steroids during past 3 months.
- Patients with haemoglobin measures of less than 10g/dl.
- Patients with platelet counts of less than 150,000 per micro litter.
- Diabetic Patients.
- Pregnant woman.
- Carpal tunnel syndrome, other peripheral nerve injury such as radial nerve injury.
- Any bony malformation, bony or articular lesion at elbow (diagnosed by radiographic imaging)
- Other causes of elbow pain such as osteochondritis dessicans of capitellum, lateral compartment arthrosis, varus instability, radial head arthritis, posterior interosseous nerve syndrome, cervical disc syndrome,

cervical radiculopathy, carpal tunnel syndrome, synovitis of radio humeral joint, fibromyalgia and osteoarthritis of elbow.

- Patients older than 70 years old.

Observations

This study was carried out prospectively to evaluation of efficacy of PRP injection in patients with chronic lateral epicondylitis in department of orthopaedics at Sardar Patel Medical College and Associated Group of Hospitals, in Bikaner. A total number of 40 patients were selected on O.P.D. basis after PRP injection patient was followed up at the interval of 4th week, 8th week, 4th month and 6th month. Assessment have done using by three outcome measures: Visual Analogue Score, Nirschl Staging, Mayo elbow performance score.

TABLE.1: Distribution of cases according to age and sex

Age group (In years)	Male	Percentage (%)	Female	Percentage (%)	Total	Percentage (%)
20-30	3	14.29	3	15.79	6	15.00
31-40	5	23.81	10	52.63	15	37.50
41-50	7	33.33	5	26.32	12	30.00
51-60	3	14.29	1	5.26	4	10.00
61-70	3	14.29	0	0.00	3	7.50
Total	21	100	19	100	40	100

In our study we found that out of 40 patients of chronic lateral epicondylitis, 21 were males and 19 were females. Maximum number of the patients found with the age group of 30-40 years.

TABLE .2: Distribution of visual analogue scale(VAS) at various interval

VAS Scale	Pre injection	4th week	8th week	4th month	6th month
0	0	0	1	3	10
1-3	0	1	6	26	20
4-7	1	36	33	11	7
8-10	39	3	0	0	3
Total	40	40	40	40	40

In this study we found that before injection almost patients had their VAS score were 8-10. None of the patients has been improved their VAS score to 0 at the 4th week 25% patients have been improved their VAS score 0 at the 6th month follow-up.

TABLE. 3: Distribution of mayo score at various interval

Mayo score	Pre Injection	4th week	8th week	4th month	6th month
<60	40	8	0	3	4
60-74	0	31	32	9	6
75-89	0	1	7	25	20
≥90	0	0	1	3	10
Total	40	40	40	40	40

In our current study 50% patients have been improved their Mayo score to 75-89 at the 6th month follow-up. After PRP injection, 10% patients had their Mayo score <60 at the 6th month follow-up.

TABLE -4: Distribution of Nirschl staging at various interval

Nirschl staging	Pre Injection	4th Week	8th Week	4th Month	6th Month
1-2	2	12	28	36	37
3-4	13	26	12	4	3
5-6	24	2	0	0	0
7	1	0	0	0	0
Total	40	40	40	40	40

Only one patient before PRP injection with NIRSCHL stage 7 was 1, None of the patients found with Nirschl stage 7 at the end of 4th week, 8th week, 4th month, 6th month. Before PRP injection 60% patients with NIRSCHL stage 5-6. At the 6th month 37% patients were found with Nirschl stage 1 to 2.

TABLE 5: Post intervention exacerbation of pain

Post intervention exacerbation of pain	Male	percentage (%)	Female	percentage (%)
Yes	13	61.90	14	73.68
No	8	38.10	5	26.32
Total	21	100.00	19	100.00

In this study we found that 13 male (61.90%) patients and 14 (73.68%) female patients complained of post intervention exacerbation of the pain.

All these patients with this increase of pain after the procedure had to be given tablet paracetamole 500mg. for pain relief as a co-intervention.

No patients reported elbow stiffness. infection, reflex sympathetic dystrophy, post injection flare, erythema, facial flushing, infection, neurovascular damage or tendon rupture or other untoward complications.

TABLE 6: Mean VAS score for male and female

Follow up Period	Male		Female	
	Mean	SD	Mean	SD
Before Injection	8.29	0.96	8.53	0.90
4th Week	5.71	1.15	5.37	1.34
8th Week	4.38	1.36	3.58	1.26
4th Month	2.95	1.96	2.74	2.13
6 Month	2.48	2.18	2.42	2.46

In this study we observed that mean VAS score in both male and female have been decreased at every successive follow up period.

TABLE 7: Mean Nirschl staging for male and female

Follow up Period	Male		Female	
	Mean	SD	Mean	SD
Before Injection	4.71	0.78	4.58	1.57
4th Week	3.14	0.85	2.58	1.07
8th Week	2.38	0.86	1.79	0.54
4th Month	1.48	0.87	1.21	0.54
6 Month	1.33	0.80	1.21	0.54

In this our current study we found that mean Nirschl stage has been reduced at the successive follow up period.

TABLE 8: Mean mayo score for male and female

Follow up Period	Male		Female	
	Mean	SD	Mean	SD
Before Injection	44.05	6.25	42.89	5.35
4th Week	61.90	6.61	63.95	7.56
8th Week	68.81	7.05	70.53	10.26
4th Month	77.62	12.81	78.68	14.89
6 Month	81.90	14.62	81.58	18.03

In this study after PRP injection we found that mean Mayo score has been improved at each successive follow up period.

TABLE 9: Grip strength improve in male and female

Grip Strength	Male				Female			
	Before Injection		After Injection		Before Injection		After Injection	
	No.	%	No.	%	No.	%	No.	%
Strong	3	14.29	20	95.24	5	26.32	16	84.21
Weak	18	85.71	1	4.76	14	73.68	3	15.79
Total	21	100.00	21	100.00	19	100.00	19	100.00

In male patients grip strength has been improved from 14.29% to 95.24% following injection at the end of 6th months. In female patients grip strength has been improved from 26.32% to 84.21% following injection at the end of 6th months.

Discussion

An injection of platelet rich plasma (PRP) has been reported to be effective for the treatment of lateral epicondylitis. There was a significant decrease in pain[3,4].

It is hypothesized that mitogen such-as platelet derived growth factor induce fibroblastic mitosis and chemotactic polypeptides such as transforming growth factor cause fibroblasts to migrate and specialize and have been found to cause angiogenesis. A specific humoral mediator may promote the healing cascade in the treatment of tendinosis as well. These growth factors trigger stem cell recruitment, increase local vascularity and directly stimulate the production of collagen by tendon sheath fibroblasts[5]. The mechanism of action of both autologous blood and platelet rich plasma is attributed to degranulation of a granules of platelets releasing growth factors which play a role in tissue healing and regeneration. Platelet derived growth factor, transforming growth factor, vascular derived endothelial growth factor, epithelial growth factor, hepatocyte growth factor and insulin like growth factor are some of the factors involved. Autologous biological blood that can be exogenously applied to various tissues where, after being injected, the platelet present in the blood releases high concentrations of platelet-derived growth factors that enhance tissue healing. No activation agent was used during our procedure. The activation of the platelets will occur through the exposure of platelets to the thrombin, which is released from the tendon tissue during injection. During the first 2 days of tendon healing, an inflammatory process is initiated by migration of neutrophils and, subsequently, macrophages to the degenerative tissue site. In turn, activated macrophages release multiple growth factors, including platelet-derived growth factor, transforming growth factors alpha and beta, interleukin-1 and fibroblast growth factor. Angiogenesis and fibroplasia start shortly after day 3, followed by collagen synthesis on days 3 to 5. This process leads to an early increase in tendon breaking strength, which is the most important tendon healing parameter, followed by epithelization and, ultimately, the remodeling process.

The mean duration of pain at the time of presentation in male patient was 10.95 weeks and in female was 11.89 weeks suffering from lateral epicondylitis in our study.

Parameters like age, sex, side of elbow involved, dominance of upper limb involved, duration of symptoms of the patients were comparable in this current study we have choosed patient who has restricted range of motion. 90% had full range of motion and 10% had final 5 degree restriction of extension movement.

The severity of pain was measured pre injection and after 4 weeks, 8 weeks, 4 month and 6 months by the VAS for pain and Mayo score and Nirschl staging for functional outcome. Pre injection the mean VAS score for pain in male were 8.29 (SD 0.96) and mean VAS score for female before injection were 8.53 (SD 0.90). As were the mean Nirschl stage for males were 4.71 (SD 0.78) and for females were 4.58 (SD 1.57) as were the mean Mayo score for males before injection were 44.05 (SD 6.25) and mean mayo Score for female were 42.89 (SD 5.35).

Mean VAS score for male at end of 4^{th} week, 8^{th} week, 4^{th} month 6^{th} month were (5.71, 4.38, 2.95, 2.48) respectively.

Mean VAS score for female at end of 4^{th} week, 8^{th} week, 4^{th} month, 6^{th} month were (5.37, 3.58, 2.74, 2.42) respectively. Mean Nirschl stage for male at end of 4^{th} week, 8^{th} week, 4^{th} month 6^{th} month were (3.14,2.38,1.48,1.33) respectively. Mean Nirschl stage for female before injection was 4.58 and at end of 4^{th} week, 8^{th} week, 4^{th} month, 6^{th} month were (2.58,1.79,1.21,1.21) respectively. Mean Mayo score for male at end of 4^{th} week, 8^{th} week, 4^{th} month 6^{th} month were 61.90,68.81,77.62,81.90 respectively. Mean Mayo score for female at end of 4^{th} week, 8^{th} week, 4^{th} month, 6^{th}

month were 63,95,70.53,78.68,81.58 respectively. At 6 month after injection mean VAS score for males were 2.48 (SD 2.18) and for females mean VAS score were 2.42 (SD 2.46) as were mean Nirschl stage for males were 1.33 (SD 0.80) and for females were 1.21 (SD 0.54). as were after 6 month of injection mean Mayo score for males were 81.90 (SD 14.62) and for females mean mayo score 81.58 (SD 18.03).

In male patients grip strength has been improved from 14.29% to 95.24% following injection at the end of 6th months. In female patients grip strength has been improved from 26.32% to 84.21% following injection at the end of 6th months.

In out of 21 male participants 13 male (61.90%) complained of post intervention exacerbation of pain while in out of 19 female participants in (73.68%) complained of increase of pain after injection.

All these patients with this increase of pain after the procedure had to be given Tablet Paracetamole 500 mg. for pain relief as a co-intervention.

In our current study no patients reported elbow stiffness. Infection, reflex sympathetic dystrophy, post injection flare, facial flushing, infection, neurovascular damage or tendon rupture or other untoward complications.

Our study co relates with study of Wolf et al[6] (2011) and Kazemi et al[7] (2010) who reported no complication of erythema, swelling, nausea. Ozturan et al[8] (2010) in their study found that. 21% of patients have elbow erythema, 16% had swelling and 21% had nausea.

This study was designed to evaluate the efficacy of PRP injection in patient with lateral epicondylitis. The both male and female had similar effect in decreasing pain and functional outcome. There was significant improvement in decreasing of pain and disability of function following the PRP application after 6 months of injection.

On the basis of Mayo elbow performance score out of 40 patients, 10 (25%) patients had excellent result (Mayo score ≥90), 20 (50%) patients had good result (Mayo score 75-89) and 6 (15%) patients had fair result (Mayo score 60-74).

Out of 40 patients 4 (10%) patients had poor result after at the time 6 month of injection (Mayo score < 60).

Our results are coherent with the results of the study conducted by Mishra and Paveloko[9], they reported a significant improvement of symptoms after 8 weeks in 60% of the patients treated with buffered PRP versus 16% of the patients treated with a local anesthetic. Similar results were observed by Heachuman et al. in their nonrandomized trial where they treated 31 patients with failed previous conservative treatment. they injected PRP in all the elbows and 90% of patients and elbows met the criteria of successful treatment.

Our results are coherent with the results of the study conducted by Mishra et al in 2013, compared PRP with an active control group and recruited 225 patients[10]. This followed a previous pilot study by the lead author in 2006, which showed a 93% reduction in pain at mean follow up of 25 months when injection PRP [11]. The original study however, was underpowered and not randomized.

The better result of PRP probably due to platelet concentration 3 to 6 time greater than that of patients blood sample which has platelet growth factor that could be effective. In cartilage healing process can stimulate process associated with tendon healing that these growth factors trigger stem cell recruitment, increase local vascularity and directly stimulate the production of collagen by tendon sheath fibroblast. Increased production of endogenous growth factors has been found in human tendons treated with PRP[12-14]

We conclude that PRP injection significantly decrease pain and increased elbow performance at 6 months follow-up. It is a effective treatment modality for the management of Tennis elbow but since it was done in 40 patients with 6 Months follow-up. The results cannot be generalised. We need a large number of patients with long term follow up to prove the efficacy of PRP injection in chronic lateral epicondylitis.

Conclusion

We conclude that PRP injection significantly decrease pain and increased elbow performance at 6 months follow-up. It is a effective treatment modality for the management of Tennis elbow but since it was done in 40 patients with 6 Months follow-up. The results cannot be generalised. We need a large number of patients with long term follow up to prove the efficacy of PRP injection in chronic lateral epicondylitis.

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