

Comparison of Local Injection of Platelet Rich Plasma and Corticosteroids in the Treatment of Lateral Epicondylitis of Humerus

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ABSTRACT

Introduction: Lateral epicondylitis or Tennis Elbow is one of the most common causes of upper extremity pain with various treatment options. Platelet-rich plasma (PRP) offers a new option for the treatment of lateral epicondylitis. This study was conducted with an aim to compare the efficacy of PRP versus methyl-prednisolone local injection in patients with lateral epicondylitis.

Materials and Methods: Sixty five patients with lateral epicondylitis were included in the study and randomized into two groups. Group A was treated with single injection of 1ml PRP with absolute platelet count of at least 1 million platelets/ mm³. Group B was treated with single injection of 1ml (40mg) methyl-

prednisolone. Pain, grip strength and functional improvements were assessed using visual analogue scale, dynamometer and quick Disabilities of the Arm, Shoulder and Hand scale respectively at baseline, 15 days, 1 month and 3 months.

Results: Sixty patients completed the follow up. All assessment parameters improved significantly in both the Groups at each follow up compared to baseline. At the end of three months group A showed significantly better improvement as compared to Group B.

Conclusion: PRP and methyl-prenisolone both are effective in the treatment of lateral epicondylitis. However, PRP is a superior treatment option for longer duration efficacy.

Keywords: Methyl-prednisolone, Musculoskeletal pain, Tennis elbow

INTRODUCTION

Lateral epicondylitis, commonly known as Tennis Elbow is one of the most common causes of musculoskeletal pain involving common extensor origin of the forearm. The disorder arises as a result of repetitive manual work involving overexertion of wrist and finger extensors and imparts significant disability in terms of quality of daily life activities. Clinically it reveals both direct and indirect tenderness at the lateral epicondyle [1]. Although the diagnosis of lateral epicondylitis is quite straight forward, there has been no consensus on the optimal management strategy [2]. Local steroid injection has been proven to provide consistent and predictable short term pain relief [3]. New treatment options include local injection of Platelet Rich Plasma (PRP), autologous blood, prolotherapy and extracorporeal shockwave therapy [4-6]. Platelet rich plasma is a concentrate of platelets derived from the patient's own blood. Platelets in PRP contain growth factors and build up reparative processes. The action of PRP therapy in chronic tendinopathies is varied and hypothesized to include angiogenesis, increase in growth factor expression and cell proliferation, increase the recruitment of repair cells and tensile strength. Lateral epicondylitis may be characterized by complex changes in the tendon in addition to an inflammatory process. Therefore, PRP owing to its high content of various growth factors may be more efficacious as a healing agent. However, studies on lateral epicondylitis with PRP treatment have yielded inconclusive results [7-9]. Hence, this study was conducted with an aim to explore the efficacy of PRP in patients of tennis elbow. The main objective of the study was to compare the efficacy of local injection of platelet rich plasma versus corticosteroids in terms of pain relief, grip strength and functional improvement.

MATERIALS AND METHODS

A prospective study on the clinical efficacy of local injection of PRP versus corticosteroids in cases of lateral epicondylitis was carried out between October 2012 to April 2014. Ethical clearance from

the human ethics committee was obtained before commencement of the study.

Sixty five patients of both genders between 21-60 years of age suffering from lateral epicondylitis were recruited for the study after obtaining written informed consent. The diagnosis was made on the basis of clinical signs and symptoms. The duration of the symptoms ranged from one to six months. Recruited patients were either on conservative treatment with analgesics and anti-inflammatory drugs or no treatment. A two week washout period was given to all the patients on analgesics and anti-inflammatory drugs. Patients with history of arthritis, trauma or fracture, nerve entrapment around elbow, bleeding disorder and psychiatric disorder were excluded from the study. Complete physical examination and relevant investigations including complete haemogram, fasting blood sugar (FBS) and plain X-ray of involved elbow were done. Selected patients were randomized to 2 groups (A and B) and not allowed to have any other treatment during the study period.

Group A patients received a single injection of PRP (1ml), with absolute platelet count of 1 million platelets/ mm³ as confirmed by manual counting. PRP was injected into the common extensor origin at the lateral epicondyle of the humerus under aseptic conditions.

PRP was prepared under aseptic conditions as per the procedure standardized in the departmental laboratory. A 9001:2000 ISO certified R-23 centrifuge was used for the purpose of platelet concentration.

Group B patients received a single injection of corticosteroid (methyl-prednisolone, 40mg in 1ml). The site of injection and the technique used was same in both the groups.

Only paracetamol (500 mgs) tablets were allowed as rescue medication for a maximum period of one week. The study was continued for a period of three months. After assessment of baseline parameters, the patients were given treatment according to their allotted group and called for follow up assessment after 15 days, 1 month and 3 months after intervention.

The study was discontinued in case of increase in pain by 3 levels on VAS, unwillingness of patient to continue or if the patient had to take paracetamol more than 2gm/day on 3 days/week for more than two weeks.

Parameters measured

Pain intensity: This was assessed using the Visual Analog Scale (VAS), a subjective assessment scale of perceived pain. VAS uses a numerical scale ranging from 0 to 10, where 0 indicates no pain and 10 indicates maximum possible pain. Assessment was done before and after the assessment of grip strength in all the four assessment sessions.

Grip strength: Jamar hydraulic dynamometer was used to assess the maximum grip strength.

Functional outcome: Functional outcome was measured using quick Disabilities of the Arm, Shoulder and Hand scale (qDASH) at baseline and in all three follow up visits. The qDASH is a shortened version of the DASH Outcome Measure. Instead of 30 items, the qDASH uses 11 items to measure physical function and symptoms in persons with any or multiple musculoskeletal disorders of the upper limb. Any adverse effect reported by the patients was also recorded.

STATISTICAL ANALYSIS

Statistical Analysis was done on SPSS for windows version. Descriptive statistical analysis was done for continuous variables, frequency distribution, mean, standard deviation and their percentages for categorical variables were calculated. Mann-Whitney test and Wilcoxon test was used for non-parametric data while t-test was used for normal distributed data. The results were considered significant at 5% of significance (p -value < 0.05).

| Age (Years) | Group A | Group B | Total |
|-------------|---------|---------|-------|
| 21 – 24 | 0 | 0 | 0 |
| 25 – 29 | 1 | 1 | 2 |
| 30 – 34 | 8 | 9 | 17 |
| 35 – 39 | 15 | 12 | 27 |
| 40 – 44 | 5 | 4 | 9 |
| 45 – 50 | 1 | 4 | 5 |
| 51 – 54 | 0 | 0 | 0 |
| 55 – 60 | 0 | 0 | 0 |
| Total | 30 | 30 | 60 |

[Table/Fig-1]: The table shows age wise distribution of patients in groups A and B

| Characteristics | Group A | Group B | p-value |
|------------------------------------|---------|---------|---------|
| Age (years) | 36.6 | 36.67 | 0.699 |
| Gender (Male/ Female) | 10 / 20 | 7 / 23 | 0.346 |
| Side (Right/ Left) | 21 / 9 | 22 / 8 | 0.112 |
| Mean duration of symptoms (months) | 2.26 | 1.93 | 0.236 |

[Table/Fig-2]: The table depicts demographic characteristics of the study population, Group A- Treated with PRP, Group B- Treated with methyl-prednisolone

| Groups | Baseline (0 days) | | 15 days | | 1 month | | 3 month | |
|---------|-------------------|-----------------------------|------------|-----------------------------|------------|-----------------------------|------------|-----------------------------|
| | VAS (Mean) | p-value Group. A Vs Group B | VAS (Mean) | p-value Group. A Vs Group B | VAS (Mean) | p-value Group. A Vs Group B | VAS (Mean) | p-value Group. A Vs Group B |
| Group A | 7.6 | 0.834 | 5.93 | <0.0001 | 4.6 | <0.01825 | 1.6 | <0.0001 |
| Group B | 7.7 | | 5.0 | | 3.4 | | 2.8 | |

[Table/Fig-3]: The table depicts the VAS (Visual analogue scale) score during follow up period in group A and B

| Groups | Baseline (0 days) | | 15 days | | 1 month | | 3 month | |
|---------|-------------------|-----------------------------|------------|-----------------------------|------------|-----------------------------|------------|-----------------------------|
| | MGS (Mean) | p-value Group. A Vs Group B | MGS (Mean) | p-value Group. A Vs Group B | MGS (Mean) | p-value Group. A Vs Group B | MGS (Mean) | p-value Group. A Vs Group B |
| Group A | 74.66 | 0.0813 | 91.66 | 0.0001 | 108.66 | 0.0065 | 156.66 | <0.0001 |
| Group B | 74.5 | | 99.83 | | 122 | | 136.16 | |

[Table/Fig-4]: The table shows the temporal pattern of maximum grip strength (MGS) during the follow up period in both the groups

RESULTS

Out of the 65 patients recruited for the study, sixty completed 3 months follow up, 30 in each group. Group A patients received PRP local injection and Group B patients received methyl-prednisolone local injection. The study could not be completed in five patients because of failure to come for follow up. The age wise distribution of the patients who completed the study is depicted in [Table/Fig-1]. Most of the patients were between the age of 30 to 39 years. The mean age, gender distribution, laterality and mean duration of symptoms were comparable in patients of Groups A and B [Table/Fig-2].

Pain- Pain was assessed using the VAS. The subjective pain report or the VAS score improved more with corticosteroid injection after 15 days ($p < 0.0001$) and one month ($p < 0.018$), however, at the end of three months improvement in pain was significantly better in PRP injection group ($p < 0.0001$) [Table/Fig-3].

Grip strength- Similar pattern of improvement in grip strength was observed. Grip strength in Group A patients showed significantly better outcome as compared to Group B patients at three months follow-up ($p < 0.001$) [Table/Fig-4].

Functional outcome- Functional outcome was measured using q-DASH scale. Gradual improvement of q-DASH score was observed in both the groups. This improvement was statistically significant in all the follow up visits in the both the groups. As in case of the other two parameters functional outcome measure (qDASH) also showed better improvement ($p < 0.001$) in Group A patients at the end of three months [Table/Fig-5]. Statistically significant improvement ($p < 0.05$) was noted in each parameter at 15 days, 1 month and 3 month follow up from baseline values in both the groups. When the groups were compared with each other, group B had statistically significant ($p < 0.05$) and better improvement than Group A at 15 days and 1 month follow up period while at 3 month follow up group A had better improvement on each parameter over Group B ($p < 0.05$). None of the patients reported any adverse affects.

DISCUSSION

Lateral epicondylitis also known as Tennis elbow, remains one of the most perplexing disorders of musculoskeletal system. Tennis elbow is thought to result from overuse or repetitive micro-trauma resulting in a primary tendinosis of extensor carpi radialis brevis (ECRB) muscle with or without involvement of extensor digitorum communis (EDC) and extensor carpi radialis longus (ECRL). Repeated dorsiflexion or pronation and supination are the most common aetiological factor.

Some studies have reported female preponderance [10,11]. However, Shiri R et al., found 1.3% prevalence of lateral epicondylitis without any gender difference [12]. The findings of our study also support a female preponderance. Chard MD and Hazelman BL stated that lateral epicondylitis involves dominant arm more frequently and occurs equally among all socioeconomic classes [13]. Similar findings are reflected from the results of our study.

| Groups | Baseline (0 days) | | 15 days | | 1 month | | 3 month | |
|---------|-------------------|-----------------------------|--------------|-----------------------------|--------------|-----------------------------|--------------|-----------------------------|
| | qDASH (Mean) | p-value Group. A Vs Group B | qDASH (Mean) | p-value Group. A Vs Group B | qDASH (Mean) | p-value Group. A Vs Group B | qDASH (Mean) | p-value Group. A Vs Group B |
| Group A | 88 | 0.6055 | 75.5 | <0.0001 | 62.5 | 0.0094 | 34.16 | <0.0001 |
| Group B | 88 | | 70.83 | | 53.13 | | 44.33 | |

[Table/Fig-5]: The table shows qDASH score during the follow up period in both the groups

Various conservative and non-invasive treatments have been tried without consistent and satisfactory results. Recent studies on chronic lateral epicondylitis have not found any significant evidence of inflammatory process; hence the term lateral epicondylitis has been suggested. Nirschl et al., found mainly fibro-elastic tissue and vascular invasion describing this condition as “angiofibroblastic tendinosis” [14]. Therefore, local injection of steroid possibly offers short term symptomatic relief only and other treatment options need to be explored for long term relief and cure of the disease process per se. In this context PRP may be regarded as a better treatment option.

However, local corticosteroid injection is one of the commonest invasive interventions with consistent and satisfactory results and hence it has become the gold standard for comparison of newer therapies. Altay et al., reviewed 13 randomized controlled trials and found that corticosteroid injection is effective in pain relief and improving grip strength as compared to other conventional therapies [15]. The exact mechanism of action of local steroid injection is uncertain. On the other hand PRP is an ideal autologous biological blood-derived product that releases high concentrations of platelet-derived growth factors on injection which enhance tendon healing due to its effects on angiogenesis and collagen synthesis. Various growth factors and cytokines in PRP include Platelet Derived Growth factors (PDGF-aa, PDGF-bb, PDGF-ab), Transforming Growth Factor beta (TGF-b1, TGF-b2), Fibroblast growth factor (FGF), Insulin Like Growth Factor-1 and 2 (IGF-1, IGF-2), Vascular Endothelial Growth Factor (VEGF), Epidermal Growth Factor (EGF), Interleukin – 8 (IL-8), Keratinocyte Growth Factor, Connective Tissue growth factor [16]. Platelets release more than 95% of the pre-synthesized growth factors within one hour of activation. This initial burst is followed by steady synthesis and secretion of growth factors for their remaining life span [17].

The present study therefore is an attempt to compare the clinical efficacy of PRP versus corticosteroid. Mishra and Pavelko [7] and Gosens T et al., [18] compared the effectiveness of leukocyte enriched PRP to standard corticosteroid treatment for lateral epicondylitis and found that at short term follow up both groups showed significant improvement in pain and function, but over long term follow up, pain and functional scores returned to baseline for corticosteroid group while that for PRP group remained high. We observed a better response with local corticosteroid injection in the initial follow up visits, however at three months, the improvement was significantly better in PRP group.

A recent double-blind randomized control study by Aziza Sayed Omar, et al., has reported that effect of corticosteroid injections lasts for about three months while that of PRP injections last for more than 6 months in providing pain relief in tennis elbow and plantar fasciitis [19]. Our findings of significant improvement in corticosteroid group

at 15 days and 1 month, while significantly more improvement in all outcome measures in PRP group at 3 month follow up are consistent with the work of Gosens T et al., and Kamezi et al., [18,20]. It is possible that PRP offers a long term healing effect on the affected tendon. The disparity in the efficacy of PRP in some studies may be attributed to the relative difference in the quantity of growth factors delivered to the degenerated tendon.

CONCLUSION

The results revealed that the long term efficacy of PRP treatment is better. Therefore, we concluded PRP as a superior treatment option in cases of tennis elbow. However, keeping in view the limited period of follow up in the present study we recommend longer follow up studies to further consolidate our findings and establish the long term efficacy of PRP in cases of lateral epicondylitis.

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