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Original Research Article

# THE ROLE OF PLATELET RICH PLASMA (LEUCOCYTE POOR PRP) AND RADIOFREQUENCY ABLATION IN TREATMENT OF LATERAL EPICONDYLITIS AT TERTIARY CARE CENTRE

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## Abstract

**Background:** Lateral epicondylitis is a common chronic disabling painful condition of the elbow. Various modalities of treatment have been recommended for lateral epicondylitis like rest, activity modification, nonsteroidal anti-inflammatory drugs, counterforce braces, massage, physiotherapy, laser treatment, extracorporeal shockwave treatment, acupuncture, ultrasound treatment and botulinum toxin type A injection. At present, platelet rich plasma (PRP) is considered as an ideal biological autologous blood derived component. The aim of this study was to test the platelet rich plasma (leucocyte poor PRP) and radiofrequency ablation in treatment of lateral epicondylitis at tertiary care centre. **Material & Methods:** This was a prospective study of 50 patients with lateral epicondylitis for the one-year period at Amandeep hospital Amritsar Punjab, India. All patients gave their informed consent to participate in the study and were divided randomly into two groups. The Disabilities of the Arm, Shoulder and Hand also assess two optional four items scales assessing the capability to do sports activity and to play a musical instrument (sport/music scale), and the capability to work (work scale). In this study, the two optional scales are not included in the analysis. The scores for 30 items are taken to calculate a total score ranging from 0 (no disability) to 100 (severest disability). Outcome is measured by the changes in pain measured by Visual Analogue Scale and Disabilities of the Arm, Shoulder and Hand Score with the time period of pre injection, four weeks, eight weeks and 12weeks.The adverse events are recorded throughout the entire 12 weeks. **Results:** Our study showed that the average age was similar: 42.9± 4.2 years in Group A and 43.34±5.6 in Group B. In both groups, there was a clear commonality between types of work: most patients were manual workers (electricians, plumbers, bricklayers and cleaners), with no differences between groups. Male to female ratio was almost similar in both groups. The right side was more common in both groups. Visual Analogue Scale (VAS) & DASH score decreases at four, eight & 12 weeks in both groups but group B was more decrease as compared to group A at four & eight weeks and increase at 12 weeks. **Conclusion:** Our result strengthens that the platelet rich plasma (Leucocyte poor) injection is better than pulse radiofrequency group. It may be concluded that the use of pulsed radiofrequency on the nerves innervating the epicondyle is effective in the middle and long term. The reduction in pain helped the recovery of strength, and these improvements contributed to an earlier return to work among patients on sick leave.

## INTRODUCTION

Lateral epicondylitis is an inflammatory condition that occurs at the origin of the common extensor tendon of forearm over the lateral epicondyle. It is the commonest chronic disabling painful condition of the elbow. It causes symptoms in 1% to 3% of the general population. It is common in people whose occupation requires frequent rotary motion of the forearm like carpenter, gardener, computer workers and knitting workers. The age of onset of lateral epicondylitis is between 35 and 50years with an equal male to female sex ratio. The dominant upper limb is most commonly affected.[1-3]

Its diagnosis is mostly clinical and its treatment is initially conservative. It usually has a long duration (6-9 months), is frequently self-limited, and is a common cause of sick leave, incurring considerable expense. Regarding its etiopathogeny, lateral epicondylitis is caused by degenerative changes and non-acute inflammation, which are only present at very early stages of the illness. It is a degenerative tendinopathy, with degeneration of collagen tissue called angio-fibroblastic tendinosis of the extensor carpi radialis brevis tendon and, at a lesser rate, of the common extensor of the fingers.[4]

Various modalities of treatment have been recommended for lateral epicondylitis like rest, activity modification, nonsteroidal anti-inflammatory drugs, counterforce braces, massage, physiotherapy, laser treatment, extracorporeal shockwave treatment, acupuncture, ultrasound treatment and botulinum toxin type A injection. Previously Injection of corticosteroids was thought to be the gold standard treatment in lateral epicondyliis. The autologus blood injection and different types of open and arthroscopic operative treatment are also advised for lateral epicondylitis.[5-9] At present, platelet rich plasma (PRP) is considered as an ideal biological autologous blood derived component. It can be injected to different tissues where, platelet is activated and it releases high levels of transforming growth factors-beta (TGF-β), platelet derived growth factors (PDGF), fibroblast growth factors (FGF), vascular endothelial growth factors (VEGF) and cytokines at the injected site. These growth factors released from platelet rich plasma promote healing of wound, tendons and bone at cellular level.[10] In addition, platelet rich plasma has high antimicrobial potency and this property may prevent infections.[11]

Radiofrequency (RF) has been postulated as an efficient option among a range of peripheral therapies. There are two types of RF lesioning in clinical use: conventional (CRF) and pulsed (PRF). RF consists of the application of high frequency current to target tissues, mainly nerves and ganglions. Conventional radiofrequency, which has been in clinical use for 45 years[12], works by raising temperature resulting in a thermo coagulation of the surrounding tissues and neuroablation; it is the more common of the two RF types. More recently, pulsed RF has been developed, a system of radiofrequency that, rather than raise temperature, aims to work by generating electric fields.[13]

Pulsed radiofrequency is a safe method and recent research suggests it may be useful in the treatment of certain painful peripheral pathologies such as omalgia[14,15], pudendal neuralgia[16], carpal tunnel syndrome[17], meralgia paresthetica[18] and joint pain.[19] The aim of this study was to test the platelet rich plasma (leucocyte poor PRP) and radiofrequency ablation in treatment of lateral epicondylitis at tertiary care centre.

## MATERIALS AND METHODS

This was a prospective study of 50 patients with lateral epicondylitis for the one year period at Amandeep hospital Amritsar Punjab, India.

**Inclusion Criteria**

- Duration of pain over lateral epicondyle more than three months
- Lateral elbow pain that is maximum at the lateral epicondyle and the pain is aggravated with pressure on the lateral epicondyle and resisted wrist dorsiflexion.

**Exclusion Criteria**

- Chronic inflammatory disease like Rheumatoid arthritis.
- Pain in hand or shoulder or neck in the same upper limb.
- Uncontrolled diabetes and systemic hypertension.
- Ulcers over the elbow.
- Tumors in upper limb.

**Methods**

All patients gave their informed consent to participate in the study, and were divided randomly into two groups.

**Group A** The carpi extensor radialisbrevis tendon was approached by means of two needles, applied for four minutes, creating an electric field that would act on the nerve fibers. As postulated by Sluijter in 2008, it is thought that this could have an inmuno-histochemical effect on the degenerated tendon.[19] If a trigger point was located at the exit of the posterior interosseous nerve, pulsed radiofrequency was also applied at this point for two minutes.

**Group B** 2ml autologus leukocyte poor platelet rich plasma (LPPRP) used in lateral epicondylitis patients. Once the exact location was determined by assessing the maximum tenderness point clinically, the patient was injected with a local anesthetic drug (Lignocaine) under sterile technique. Leukocyte poor Platelet rich plasma group was injected with 2 ml platelet rich plasma, using a “peppering” technique in a clockwise manner to better cover the affected area of lateral epicondyle.

**Platelet Rich Plasma Preparation**

The platelet rich plasma preparation has been done using desktop size centrifuge apparatus. 20 ml of whole blood is withdrawn from the patient with 18 gauge needle. Blood is mixed with anticoagulant which is 2 ml and PRP extracted from it is about 10


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ml for use. The blood is centrifuged at 2200 rpm for 12 minutes and another spin at 2000 rpm for 3 minutes. By the end of the procedure the whole blood is separated into two layers such as leukocyte poor platelet rich plasma (LPPRP) and leukocyte rich platelet rich plasma (LRPRP). Leukocyte rich platelet rich plasma (LRPRP) is discarded. Our sample has been checked and verified in the laboratory for platelet count & also for leukocyte counts.

Patient follow-up continued for six months. Since the sample size was not very large, statistical analysis of results was performed applying non-parametric procedures, including the Mann-Whitney U test and Student's T test. Significance was set at $p<0.05$.

**Disabilities of the Arm, Shoulder and Hand Score (DASH)**

The Disabilities of the Arm, Shoulder and Hand score has 30 items with self-report questionnaires structured to assess physical activity and symptoms in persons who have musculoskeletal problems of the upper limbs. These items indicates the magnitude of difficulty in doing different functional activities since this score contains the questionnaires related to arm, shoulder, or hand problems of the affected upper limb (21 items), the severity of each of the symptoms of pain, activity related pain, weakness, tingling, and stiffness (five items), and the problem's effect on social activities, daily work, and sleep and its psychological effect (four items).

The Disabilities of the Arm, Shoulder and Hand also assess two optional four items scales assessing the capability to do sports activity and to play a musical instrument (sport/music scale), and the capability to work (work scale). In this study, the two optional scales are not included in the analysis. The scores for 30 items are taken to calculate a total score ranging from 0 (no disability) to 100 (severest disability).

**Disability or symptom score:**

Minimum 27 of the 30 items should be completed for a score to be calculated. The calculated values for all completed items are added and averaged, to make a score out of five.

This value is then converted to a score out of 100 by subtracting one and multiplying by 25. This conversion is carried out to make the score easier to compare with VAS on a 0 to100 scale. A high score indicates severe disability.

DASH disability or symptom score = [(sum of n responses) - 1] /n x 25where n is equal to the number of completed responses.

**Visual Analogue Scale (VAS):**

A Visual Analogue Scale (VAS) is a measuring scale that tries to measure a characteristic or attitude of pain that is believed to range across a continuous spectrum of values and cannot be measured directly. Simply, it is a measuring scale to quantify the amount of various pain notified by the patients. Scores range from 0 (no pain) to 100 (severest pain). The amount of pain that a patient indicates can range across a continuous spectrum from none to severest amount of pain. From the patient's perspective, this spectrum appears as continuous and their pain does not take discrete value as a classification of none, mild, moderate and severe. Visual Analogue Scale is used to make out this idea of an underlying continuous spectrum of pain in patients.

Operationally a Visual Analogue Scale is often a horizontal line, 100 mm in length, written with word description at each end. Patients make a mark on the line, the point that they feel indicates their perception of their current pain value. The Visual Analogue Scale score is recorded by measuring in millimeters from the right side end of the line to the point that the patient marks.

Outcome is measured by the changes in pain measured by Visual Analogue Scale and Disabilities of the Arm, Shoulder and Hand Score with the time period of pre injection, four weeks, eight weeks and 12weeks.The adverse events are recorded throughout the entire 12 weeks.

## RESULTS

Our study showed that the average age was similar: 42.9± 4.2 years in Group A and43.34±5.6 in Group B. In both groups, there was a clear commonality between types of work: most patients were manual workers (electricians, plumbers, bricklayers and cleaners), with no differences between groups. Male to female ratio was almost similar in both groups. The right side was more common in both groups [Table 1].

The average Visual Analogue Scale (VAS) and Disabilities of the Arm, Shoulder and Hand (DASH) scores in both the groups of pre injection, four, eight and 12 weeks post injection are shown in table no. 2. Visual Analogue Scale (VAS) & DASH score decreases at four, eight & 12 weeks in both groups but group B was more decrease as compared to group A at four & eight weeks and increase at 12 weeks.

**Table 1: Demographic variables ingroup A & group B**

| Demographic variables | | Group A (N=25) | Group B (N=25) | P-value |
|---|---|---|---|---|
| Mean Age (yrs) | | 42.9±4.2 | 43.34±5.6 | >0.05 |
| Sex | Male | 19 | 18 | >0.05 |
| | Female | 6 | 7 | |
| Side | Right | 30 | 29 | >0.05 |
| | Left | 10 | 11 | |


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**Table 2: VAS & DASH Comparison in Both Platelet Rich Plasma Group and Pulse Radiofrequency Group**

| Score | Avg. Pre-injection score | | At 4 weeks | | At 8 weeks | | At 12 weeks | |
|---|---|---|---|---|---|---|---|---|
| | Group A | Group B | Group A | Group B | Group A | Group B | Group A | Group B |
| VAS | 66.5 | 65.6 | 54.7 | 52.3 | 44.3 | 43.8 | 36.8 | 37.5 |
| DASH | 56.3 | 55.4 | 44.6 | 43.8 | 34.9 | 35.5 | 30.4 | 33.8 |

## DISCUSSION

Lateral epicondylitis first appears, insidiously and gradually, as pain on the lateral side of the elbow. It is usually associated with weakness and a feeling of loss of strength in the hand. Treatment is normally conservative and has satisfactory results in 90% of cases. But in the remaining 10%, supplementary treatments are recommended, based on physical therapy and ergonomic changes in the workplace. The age of onset of lateral epicondylitis is between 35 and 50 years with an equal male to female sex ratio.

While numerous articles on different conservative treatments proclaim hopeful results, few give scientific evidence of their efficacy. In 2002, Rohof suggested that pulsed radiofrequency might provide an effective treatment for less severe pain arising from lateral epicondylitis. However, no published research has defined what the exact target of PRF treatment should be in cases of epicondylitis. PRF was developed in 1995, and its first clinical application was performed on 1st February 1996.[13]Its mechanism of action is still unknown but is an ongoing topic of investigation. It has traditionally been considered a neuro-modulating technique[20] with no side effects. However, Cosman and CosmanSr.[21] claimed that destructive effects could be expected to occur at microscopic level. The most likely causes of pathology of RF lesions are heat, high electric fields and high current fields, which produce changes in cell structure, electroporation and the destruction of membranes. This would bring about certain mini ablation in the surrounding tissues, but only in a thin surrounding layer of about 0.3 mm. The small area of tissue destruction following PRF may be attributed to heat spikes.

We hypothesise that this improvement is likely to come from growth factors present in the PRP injection. Platelets have been shown to contain growth factors such as; platelet derived growth factor (PDGF); transforming growth factor (TGF)-β; insulin-like growth factor (IGF); epidermal growth factor (EGF); vascular endothelial growth factor (VEGF) and fibroblast growth factor (FGF).[22] These factors are released from the alpha granules after injury and bind of target cells (e.g. mesenchymal stem cells, osteoblasts, fibroblasts, endothelial cells, and epidermal cells). These receptors activate an intracellular signal protein that causes the expression of a gene sequence that then directs cellular proliferation, matrix formation, osteoid production or collagen synthesis dependent on the cell activated.[23] Specifically with regards to tendon damage/healing in lateral epicondylitis PRP injection would increases collagen production and cell viability and stimulate angiogenesis due to the release of the above factors.[22]

This could explain the findings of Gautam et al who showed not only improvement in symptoms following PRP injection but also increase in tendon thickness/vascularity.[24]

With regards to the differences in L-PRP, used in this study, and P-PRP it has been hypothesized that the leucocytes in L-PRP create an antibacterial response and debride the dead tissue allowing the tendon to regenerate using the above growth factors.[25]

Comparing the results prescribed in this study with the results of three months follow up, the outcome in the pulse radiofrequency group is declined, whereas the outcome in the platelet rich plasma group is maintained. A significant finding is that the platelet rich plasma group had worse preinjection VAS scores and better after 12 weeks. This strengthens our conclusion that the platelet rich plasma injection is better than pulse radiofrequency group.

## CONCLUSION

Our result strengthens that the platelet rich plasma (Leucocyte poor) injection is better than pulse radiofrequency group. It may be concluded that the use of pulsed radiofrequency on the nerves innervating the epicondyle is effective in the middle and long term. The reduction in pain helped the recovery of strength, and these improvements contributed to an earlier return to work among patients on sick leave.

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