Platelet Rich Plasma: A treatment Modality In Tennis Elbow

Dr. Kushal Aggarwal
Intern, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar
E-mail: ambitiouskushal@yahoo.com

Dr. Seerat Sandhu
Intern, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar
E-mail: seeratsandhu2206@gmail.com

Dr. Aditya Bhardwaj
Assistant Professor, Orthopedics, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar
E-mail: dradityabhardwaj@gmail.com

Abstract

Objective:
To determine the efficacy and advantages of Platelet Rich Plasma injection over Autologous whole blood and steroid in the treatment of Tennis elbow (Lateral Epicondylitis).

Methods:
The study was a randomised study conducted in the department of Orthopedics at Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab.

Results:
Platelet Rich Plasma injections proved to be more efficacious as compared to Autologous Whole Blood and Steroid injections.

Keywords: Platelet Rich Plasma; Autologous whole blood; Steroids; Lateral Epicondylitis.

Introduction

Lateral epicondylitis known as tennis elbow is a repetitive strain injury caused by repetitive overuse of the extensor muscles of the wrist. It is the most frequent type of myotendinosis occurring more specifically at the common extensor tendon that originates from the lateral epicondyle [1, 2]. The frequency of lateral epicondylitis is reported between 1 to 3% among normal nonathlete population [3].

Epicondylitis was initially believed to be an inflammatory process but in 1979, it was described as the disorganization of normal collagen architecture by invading fibroblasts in association with an immature vascular reparative response, which termed it as “angiofibroblastic hyperplasia” [1, 2]. This injury predominantly involves the origin of the short radial extensor muscle of the carpus, in which microtears develop as a result of excessive and abnormal use, with formation of immature repair tissue. Histologic findings in chronic cases confirm that tendinosis is not an acute inflammatory condition but rather a failure of the normal tendon repair mechanism associated with angiofibroblastic degeneration [1-3]. Current research has produced several biological hypotheses regarding
the cause of tendinosis based on histopathological, biochemical, and clinical findings that show cell apoptosis, angiofibroblastic features, or abnormal biochemical adaptations, largely suggesting that a failed healing response underlies the condition [4]. It causes pain and functional impairment in daily activities [2, 3]. The treatment of this condition includes conservative therapy and surgical interventions [3, 4]. The effectiveness of oral nonsteroidal anti-inflammatory agents, topical and injectable medications including corticosteroids and botulinum toxins, splinting, physical therapy, and iontophoresis has been evaluated in many studies [4]. However, these traditional therapies do not alter the tendon’s inherent poor healing properties secondary to poor vascularization [5, 6]. Given the inherent nature of the tendon, new treatment options including platelets rich plasma (PRP), autologous blood, and prolotherapy are aimed at inducing inflammation rather than suppressing it [7–9]. Two different preparations that are most described in the literature are autologous whole blood (AB) and platelet-rich plasma (PRP) injection [5, 10, 12, 14, 19, 21, 23]. PRP is quite a new treatment used for chronic tendinitis [4]. Platelet rich plasma is defined as a volume of the plasma fraction of autologous blood having a platelet concentration above baseline [6]. Both PRP and autologous blood contain platelets, and these platelets have strong growth factors and granules that have critical role in the healing process of chronic injuries [7, 8]. Due to higher concentration of platelets in PRP than whole blood, it was shown to have greater effect in the repair process in treatment of chronic nonhealing tendinopathies including tennis elbow [4, 8, 9]. Therapeutic PRP should have a platelet concentration 4 to 6 times greater than that of whole blood (200000/mm3). The concentrations less than or greater than this amount may be ineffective or inversely lead to suppression of the healing process [4, 6, 7]. Known platelet growth factors stimulate the healing process and lead to partial modification of the damaged tissue [9-11]. The net results of PRP therapy in chronic tendinopathies are varied and hypothesized to include angiogenesis, increase in growth factor expression and cell proliferation, increase the recruitment of repair cells also, tensile strength [9,10]. Due to higher concentration of platelets in PRP than whole blood, it was suggested in some studies to have greater effect in the healing and repair process [12,13]. Various results have been published about applications of PRP in different fields such as skin and hair, ENT, orthopaedics etc. [14,15]. PRP use has also been evaluated in musculoskeletal disorders such as muscular injuries, achille and lateral epicondyle tendinopathies with satisfactory results [8,12]. Some studies have shown that local injection of autologous whole blood has greater therapeutic effect than steroid injection in treating tennis elbow [5, 10, 11]; also there are studies showing the greater efficacy of local autologous PRP than corticosteroids in treating this disorder [4, 8]. However, only a few studies have been conducted to compare the efficacy of these two treatments. Considering the high cost of autologous PRP therapy and lack of a study comparing autologous whole blood versus PRP injection objectively, this study was designed to evaluate the efficacy of autologous whole blood injection as a less costly treatment versus PRP in patients suffering from chronic lateral epicondylitis.

**Methodology**

The study was a randomised control trial and was carried in the Department of Orthopaedics in Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab.

**Patients and Setting:**

All patients with clinical signs and symptoms of chronic lateral epicondylitis during April 2018–October 2018 presenting in the department were considered to be a part of the study.

**Inclusion Criteria:**

Criteria for inclusion in the study were chronic clinically diagnosed lateral epicondylitis (based on symptoms, site of tenderness, and pain elicited with resisted active extension of the wrist in pronation and elbow extension); with duration of symptoms more than 3 months and pain severity with minimum score of 5 (based on 10 scale Visual Analogue Score (VAS)).

**Exclusion Criteria:**

Patients were excluded if they were pregnant, older than 75 years, had history of trauma, any platelet dysfunction syndrome (Critical thrombocytopenia), any other coagulopathies (such as hypofibrinogenemia), local infection at the site of the procedure, any recent febrile or infectious disease, consistent use of NSAIDs within 48 hours before procedure, recent use of corticosteroids during last 2 weeks, a history of local injection of any medications (steroid, whole blood, PRP, or dry needling) into the
site of lateral epicondyle, hemoglobin <10 gr/dL, plasma platelets count <100000 mm$^3$, history of any malignancy (including hematologic and non-hematologic malignancies), carpal tunnel syndrome, cervical radiculopathy or peripheral radial nerve injury, systemic illnesses including ischemic heart disease, diabetes, rheumatoid arthritis, hepatitis, any bony malformations, bony or articular lesions at elbow (diagnosed by radiographic imaging), a history of vasovagal syncope, or hemodynamic instability.

**Ethical Considerations:**

From the ethical point of view, all patients gave written consent for inclusion in the study. The process of the treatment was simplified and explained to the patients and only after the patients completely understood the study protocol and became aware of their rights during the study, the written consent form was signed by the patients. The institutional review board of Sri Guru Ram Das Institute of Medical Sciences and Research approved the protocol of this study. The process of treatment had no harm for their health, and they had authority to stop the process of treatment.

In case of very rare incidence of side effects associated with PRP or autologous blood injection (persistent pain and swelling, infection and fibrosis, or any neuromuscular complications at injection site) or steroids patients had access to the project’s incharge in order to contact him if they encountered any of the possible adverse reactions to injection.

**Randomization and patients’ enrollment:**

The block covariate adaptive randomization method is designed to randomize subjects into the treatment groups. This led to equal sample sizes within each group and balance of the important covariates. Thus, a new participant is sequentially assigned to particular treatment groups by taking into account the specific matched covariates and previous assignments of participants.

**Intervention:**

**Group 1 (Autologous Platelet Rich Plasma (PRP) group):**

The treatment protocol for patients in this group was a single injection of 2 mL of autologous PRP, deep at the origin of wrist extensors, into maximal tenderness point at elbow region under aseptic technique. The patient was placed in an appropriate and comfortable position that allowed for sterility and access to the site of injection. The skin of the injection site was prepped and draped and the liquid PRP was injected in a sterile condition using a 18 G needle. The patient received a PRP injection at maximal point at elbow using a peppering technique spreading in a clock-like manner to achieve a more expansive zone of delivery.

**Group 2 (Autologous whole blood):**

The treatment protocol in this group included a single injection of 2 mL of autologous peripheral whole blood under the same technique as the PRP group. Two ml of lidocaine 1% was injected 8 minutes before PRP or whole blood injection for patients in both groups.

**Group 3 (CorticoSteroid):**

The treatment modality in this group included a single injection of 2ml of corticosterone under the same technique as the preceding 2 groups.

No cortisone or nonsteroidal anti-inflammatory drugs were prescribed during follow-up. For pain relief only, oral paracetamol and ice therapy were used. Patients of all the 3 groups were requested to refrain from heavy labor activities for a week. Tennis elbow strap was administered for all patients and they were instructed to apply the strap 2 centimetres below the maximal tenderness point at elbow. The patients were followed via weekly telephone calls and instructed how to use elbow splint and perform exercises. Three days after the injection, each patient was asked to start a simple program of extensor muscles stretching and 2 weeks after injection eccentric loading exercises were prescribed to be performed on an individual basis every day for 5 weeks. The patients were allowed to perform full activities of daily living after 4 weeks.

**Parameters used to measure results:**

**Pain Intensity:** Pain severity was evaluated before injection and re-evaluation was done at 4 and 8 weeks, after the injection. Visual Analog Scale Analog Pain Score (VAS) (range, 0 [no pain] to 10 [agonizing pain]) was used.
Modified Mayo Clinic Performance Index:
“Modified Mayo Clinic performance index” for the elbow was used as a valid and reliable measure to evaluate the functional improvement after therapy (15). The Mayo Clinic performance index for the elbow has 4 parameters: pain, motion, stability, and daily function. The maximum score is 100 and the minimum index is 0; the results are interpreted as excellent (≥90), good (75–89), fair (60–74), and poor (<60). The pain parameters in this questionnaire carries the highest points which is 45 out of 100 (16). The modified mayo questionnaire was very specific to changes in elbow function. The questions were found to be reliable, reproducible and sensitive to change in elbow function (15). Its construct validity is good for patient-rated variables and excellent for physician-rated variables. Mayo questionnaire was filled out via interviewing each patient before and after therapy.

Statistical Analysis: Computer software SPSS-16 was used for data analysis.

Results

In this study, 70 patients were initially out which 5 were excluded and eventually 60 patients completed the study. The mean age of patients was 35 ± 2 years old. 32 patients were females (53.3%) and 28 patients were male (46.7%). 53 patients were right handed while 7 were left handed. The mean duration of symptoms in all 3 groups was 9±3 months.

<table>
<thead>
<tr>
<th>Males</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>32</td>
</tr>
<tr>
<td>Platelet Rich Plasma Injection</td>
<td>20</td>
</tr>
<tr>
<td>Autologous Whole Blood Injection</td>
<td>20</td>
</tr>
<tr>
<td>Corticosteroid Injection</td>
<td>20</td>
</tr>
</tbody>
</table>

PRP Characteristics:

The mean platelets count of all patients at baseline was 220000/mm³ ± 23000, which increased to 990000 ± 43000 (4.5 times) in PRP preparation.

Outcome Measures:

All outcomes including VAS and Mayo scores were measured before intervention, then they were measured 4 and 8 weeks after initiating therapy in each group.

VAS Score:

Post intervention (4-Week Followup):

Mean VAS score decreased significantly in all 3 groups.

Post intervention (8-Week Followup):

Mean VAS score decreased significantly compared to 4 week only in PRP group. VAS score did not change significantly compared to 4 week follow up at 8 week follow up in AWB group and corticosteroid group.

Mayo Score:

Post intervention (4-Week Followup):

Mayo score improved significantly in all 3 groups.

Post intervention (8-Week Followup):

Mayo score improved significantly compared to 4-week follow up only in PRP group. However, the change in Mayo score compared to 4-week followup was not significant in AWB group and corticosteroid group at 8-week followup.

Therefore, at 8-week evaluations, pain improvement according to VAS and Mayo scores remained significant only in PRP group.
Discussion

The natural history of tennis elbow has been shown to be self-limiting in the majority of sufferers, with most recovering within 1 year with conservative management. The most effective treatment for chronic lateral epicondylitis, however, is argued amongst experts. There are numerous studies suggesting successful outcomes with physiotherapy for acute cases, with up to 90% resolution. Previously, cases that persisted despite physiotherapy had been treated with corticosteroid injections. Steroid injections were reported to give short-term pain relief, however, the proven recurrence rates and complications (including dermal depigmentation, subcutaneous atrophy, and a theoretical risk of increased tendon rupture) should limit their use.

This led to further research in order to identify new treatment modalities like Autologous Whole Blood and Platelet Rich Plasma injections. Studies started being conducted to compare the efficacies of Autologous Blood and Platelet Rich Plasma.

According to the results of our study, local injection of PRP and autologous whole blood into lateral epicondyle both led to significant improvement in subjective (Visual Analog Score) at 4 weeks of followup. Improvement in functional score was also noted according to Mayo score.

However, at 8 weeks of follow up significant improvement was seen only in the PRP group. The exact mechanisms by which PRP initiates cellular and tissue changes are presently being investigated [6]. There is enough laboratory evidence of PRP effect on tendon healing [7]. It has been considered in some studies that platelet growth factors could be effective in the cartilage healing process in knee osteoarthritis [8]. PRP can stimulate processes associated with tendon healing. The proposed mechanism of action is the elicitation of a healing response in the damaged tendons by growth factors present in the blood [6]. These growth factors trigger 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 human tendons treated with PRP [3, 7, 9].

Conclusion

PRP and autologous whole blood injections and steroid injections are all effective methods to treat chronic lateral epicondylitis. However, at 8-week followup, PRP treatment seems to be a more effective treatment with more persistent efficacy than autologous blood and steroids in relieving pain and improving function.

Because PRP and whole blood are autologous and are prepared at the point of care, they have an excellent safety profile.

The limitation of our study was the relatively small number of cases included, absence of a control group receiving no intervention, and short-term follow-up evaluations. More number of Randomised Control Trials need to done to investigate the efficacy, timing and dose of injections.

References


