

## EFFICACY OF PLATELET-RICH PLASMA IN TENNIS ELBOW IN PATIENTS PRESENTING IN A PUBLIC SECTOR HOSPITAL: A PROSPECTIVE OBSERVATIONAL STUDY

Muhammad Zafar Iqbal Shahid,<sup>1</sup> Muhammad Khalid Syed,<sup>2</sup> Muhammad Khalid,<sup>3</sup> Siddique Hamid,<sup>4</sup> Mubashir Farhan,<sup>5</sup> Asim Islam<sup>6</sup>

### Abstract

**Background:** Platelet rich plasma (PRP) is a supra-physiological concentrate of growth factor. It is biologically safe, minimally invasive and low cost injectable technique for tendinopathies. Evidence suggests that PRP contains bioactive protein and growth factor that promote regeneration. Aim of this study is to assess the efficacy of PRP in tennis elbow and to evaluate its impact on pain and functional outcomes.

**Methods:** It was a prospective observational study in department of orthopedics surgery, Services Hospital Lahore from December 2017 to June 2019. Forty 40 patients with chronic tennis elbow lasting 4-6 months, both males and females with aged between 18-60 years were included. Thirty milliliters of patient's autologous blood was taken from median cubital vein and 6-7ml of platelet rich plasma was injected at the point of maximal tenderness at extensor carpi radialis brevis (ECRB) tendon. Patients were followed at 2 weeks, 6 weeks, 3 months and 6 months. Functional outcomes were assessed at each visit using Oxford Elbow Score, while visual analogue score (VAS) was used to assess pain.

**Results:** Mean Pre-injection VAS was  $8.0 \pm 2.01$  in all patients. At six months, VAS was  $1.06 \pm 1.90$  in 34 patients. In six (15%) patients, VAS did not improve. Pre-injection Oxford Elbow Functional score (OES) was  $20.12 \pm 4.08$  (range:22.2-26.8). After 6 month of injection, among 34 patients, it improved to  $72.12 \pm 12.25$  (range: 42.34-90.52)

**Conclusion:** PRP is effective in terms of pain and improvement of function of elbow in patients with tennis elbow. It is cost effective, minimally invasive, simple and safe. Although literature shows some controversy of PRP in tendinopathies but still the regenerative medicine has opened a new window for restoration of tendinopathies

**Key Words:** Platelet Rich Plasma, Growth factors, Tennis Elbow, Lateral Epicondylitis

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Tennis elbow is condition of varying degree of tendinopathy of lateral elbow which is especially common in manual workers and tennis players. It is actually a misnomer and it is generally accepted that the tennis elbow accounts only 5% in tennis players.<sup>1</sup>

The condition was first described by German Surgeon in 1873. In 1882, another British Surgeon described the condition causing pain in lateral aspect of the elbow in tennis player.<sup>2</sup> Since then tennis elbow has become synonymous with the pain on the lateral aspect of the elbow. Despite the fact, it is related to the repetitive work involving the elbow extension in persons who do not play tennis.<sup>3</sup>

Biomechanically, repetitive micro-trauma to the Extensor Carpi Radialis Brevis (ECRB) muscle resulting from back hand tennis strokes while playing tennis causes micro-tears in the tendon.<sup>4</sup> This results in relative hypo-vascularity in the region of tendon in tennis player. The most common flaws are lateral contact on back-

<sup>2</sup> Ameer-ud-Din Medical college Lahore

<sup>4,5</sup> Lahore General Hospital Lahore

<sup>1,3,6:</sup> Department of Orthopedic Surgery, Ameer-ud-Din Medical College/LGH, Lahore

### Correspondence:

Dr Muhammad Zafar Iqbal Shahid, Department of Orthopedic Surgery, Ameer-ud-Din Medical College/LGH, Lahore

Email: dr.zafar2014@gmail.com

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hand stroke and it forces the player to extend the elbow forcefully.<sup>5</sup> This pre-disposes to trauma to ECRB. Histologically, tennis elbow is a disorder called tendinosis of common extensor tendon, mostly involving ECRB.<sup>6</sup> Neurochemicals including glutamate, substance-P and calcitonin gene related peptides have been identified in patients with chronic tennis elbow.<sup>7</sup> Moreover, during repetitive movements of the elbow involving extensor muscles like golfing and playing music put extensor group of muscles at maximum contraction. The vibratory and twisting movements would be transmitted through the muscles directly at the site of tendon insertion.<sup>8</sup> In this way the force causes micro-trauma at the muscle tendon interface, as the force is transmitted to the muscle. Manual workers have pain in the lateral elbow when they extend the wrist against resistance or it results from repetitive movements when the wrist and elbow are in extension. In addition to pain, there is weakness in wrists and digital extensors. Point of maximal tenderness would differentiate the tennis elbow from other conditions like elbow arthritis and radial tunnel syndrome.<sup>9</sup> Patient usually present with pain which can be sharp, dull or it is poorly defined at the lateral epicondyle with dorsiflexion of wrist against the resistance. Usual age of presentation for this disease is 35-50 years with male to female ratio of 1:5. Number of treatment options are available to treat tennis elbow.<sup>10</sup> These are muscle stretching and strengthening exercises including active and passive exercises,<sup>11</sup> NSAID,<sup>12</sup> corticosteroid injections,<sup>13</sup> platelets rich plasma injections,<sup>14</sup> hyaluronic acid injections,<sup>15</sup> Botox injections,<sup>16</sup> autologous blood,<sup>17</sup> ultrasound therapy,<sup>18</sup> extra corporeal shock wave therapy,<sup>19</sup> Laser therapy, splintage and braces,<sup>20</sup> acupuncture and icepack massage, trans-friction massage, etc. All these are effective in 80 to 90% of the cases. In 10% of the cases, surgery either open or endoscopic lengthening of the ECRB tendon is done. In selective number of patients, some surgeons also perform the percutaneous needle tenotomy,<sup>21</sup> The use of PRP is a pro-active therapeutic option. It stimulates the bones and tissue healing process as it contains the several different growth factors and cytokines.<sup>22</sup> These are Platelets derived growth factors, Vascular Endothelial growth factors, Fibroblast growth factors (FGF),

Insulin like growth factors 1 & 2 and Interlukin-8.<sup>23</sup> Aim of this study is to assess the efficacy of PRP in tennis elbow and to evaluate its impact on pain and functional outcomes.

## METHODS

This prospective observational study was conducted in department of orthopedic surgery services hospital, Lahore. After institutional review board approval, 40 patients with chronic tennis elbow on the basis of positive clinical tests (Thomson's Cozen's Test) were enrolled for this study from outpatient department. Each patients was counseled and written permission was taken. Patient with infection, previous major elbow trauma, patient with previous steroid injection treatment, cervical myelopathy and arthritis were excluded. Thirty milliliters of patient's own blood was withdrawn and centrifuged to separate the platelet rich plasma. About 6 to 7 ml of PRP obtained and was injected at the point of maximal tenderness. We used the VAS score for pain assessment for these patients and the elbow function was assessed with Oxford elbow score. Each patient was followed and evaluated after 2nd week, 6 weeks, 03 months and after 06 months. At each follow up, the pain assessment was done by VAS score while functional assessment was obtained using oxford elbow score (OES). We used SPSS version 19.0 for data management and analysis. Mean and Standard deviation was calculated for VAS and functional assessment score and paired t test was use to assess statistical significance with  $p < 0.05$  used as statistical significant.

## RESULTS

Of 40 patients enrolled for this study, mean age was  $40.3 \pm 7.5$  years (range: 25 to 60 years). Out of 40 patients, there were 32 females and 8 males. Right elbow was involved in 30 patients (75%) while the left elbow was involved in 10 patients (25%). All these patients had symptoms of chronic tennis elbow for the last 4 - 6 months (mean  $3.5 \pm 1.2$  months) and these patients failed to respond to conventional therapy. At the time of initial presentation, 20 patients had severe pain, 14 with moderate pain and 6 patients had mild pain at the lateral side of elbow.

The mean Pre-injection VAS was  $8.0 \pm 2.01$  in all patients (Table 1). It is significantly improved after 02 weeks and in the subsequent follow-ups. In 34 patients (85%), it was  $5.7.2 \pm 2.56$  after two weeks. Mean VAS score was  $4.2 \pm 2.2$  at the end of 06 weeks. VAS score recorded at the end of 03 months  $3.25 \pm 2.2$ . This shows a significant decrease in VAS score. Twenty Patients were completely free from pain and VAS score was 0 after 03 months in these patients. At the end of 06 months, 34 patients were completely relieved of pain. The mean VAS score was  $1.06 \pm 1.90$  (Table 1). Function of elbow was assessed by Oxford Elbow Score (OES). All these patients were having localized tenderness at the lateral condyle. Total of 34 patients responded to PRP injection while 06 patients showed no response to the PRP injection. Two weeks after the injection the mean OES was improved to 48.72 (range: 28.83-68.62). The mean OES was  $62.60 \pm 23.68$  (range: 34.52-83.12) after 06 weeks while after 03 months the mean OES was  $65.70 \pm 18.52$  (range: 40.51-85.10). At the end of final follow up after (at 06 months), the mean OES was  $72.12 \pm 12.25$  (range: 42.34-90.52) (Table 1). No complications were observed in any patients except 10 patients complained of pain at the site of injection in the first three days. All these patients were treated with ice fomentation and NSAIDs for 03 days. After 06 months, no patient developed recurrence of pain except 06 patients who did not respond to PRP injection.

## DISCUSSION

Tennis Elbow occurs in persons who have repe-

**Table 1:** VAS and Oxford Elbow Score before and after platelet rich plasma (PRP) in patients with tennis elbow presented in OPD of Services Hospital Lahore (n=40)

Score	Before PRP injection	Six months after PRP injection	p-value*
VAS score (Mean $\pm$ SD)	$8.0 \pm 2.01$	$1.06 \pm 1.90$	P< 0.001
Oxford Elbow Score (Mean $\pm$ SD)	$20.12 \pm 4.08$	$72.12 \pm 12.25$	P< 0.001

**Abbreviations:** SD, Standard deviation, t, student t-test. Paired student's t-test was used to examine difference in mean scores.

tive wrist and elbow extension activities with strong grip.<sup>1</sup> It mostly occurs in patients who do not play tennis at all. It is a degenerative process involving the ECRB tendon. There is failure of normal regenerative process with angioblastic degeneration,<sup>3</sup> as the tendon is relatively hypo-vascular.<sup>4</sup> Hypo-vascularity causes hypoxic tendon degeneration<sup>5</sup> which is a cause of this tendinosis.<sup>6</sup> In the present study, we evaluated and assessed the efficacy of platelets rich plasma in tennis elbow. Our study shows that PRP injection not only improve the pain and functional status of elbow but also has impact on psycho-social status of the patient. Out of 40 patients, only 06 patients (15%) did not respond to PRP injection. These patients underwent operative intervention. No adverse effects were reported in our study. Recent studies are saturated with articles regarding the effectiveness of PRP injection in Tennis Elbow. In 2018, Graham et al. conducted a study reporting that PRP injection reduces the need for surgical intervention. They concluded that PRP injection are safe and effective to relieve the intractable lateral epicondylitis. Moreover, it also reduces the need for surgical interventions.<sup>9</sup> Kumawat et al. carried out a study on 100 patients with lateral epicondylitis. All patients were injected PRP. They came to conclusion that PRP improved the pain and functional status of elbow. PRP procedure is simple, minimally invasive and easy to conduct on OPD basis with low recurrence rate.<sup>10</sup> In another study, Kemp et al. clearly indicate that PRP is superior to corticosteroid injection in lateral epicondylitis. It reduces the pain and improves the elbow function in tennis elbow.<sup>11</sup> Similar results were reported by Tang at al. who compared the PRP versus autologous blood versus corticosteroid. They deduced that PRP is effective in pain relief and improvement of elbow function in tennis elbow as compared to corticosteroid on long term basis.<sup>12</sup> In view of Kim at al. local platelet plasma and surgical treatment produced equivalent pain and functional outcomes in patients with tennis elbow. PRP injection may present a reasonable alternative treatment for patients who are apprehensive to proceed for surgery or they are poor candidate for surgical intervention.<sup>13</sup> Paramantham et al. also showed that PRP injection

demonstrated an effective reduction in pain and functional status of elbow especially in case of younger patients.<sup>14</sup> All these studies came to the conclusion that PRP injections provide a highly concentrated cocktail of growth factors that speed up the healing process in tennis elbow. Platelets constitute a reservoir of cytokines and growth factors that may govern and speed up the tissue healing. Further, recruitment of inflammatory cells, tenocytes, neo-vascularization and fibroblast proliferation is mediated by cytokines.<sup>15-17</sup> Moreover, PRP also inhibit some pro inflammatory cells that have detrimental effects in early stage of healing of tissue specially suppressing the IL-1 release from activated macrophages.<sup>18-21</sup> There are few limitations of our study. The sample size was small. Moreover, the maximum follow-up period was one year. A multi centric study with large sample size and with long follow up should be done to provide concrete evidence on the long term benefits of PRP injection. Further research is needed for optimal dose, cellular composition and rehabilitation protocols for PRP injections. The functional outcome and pain assessment are subjective in nature. These lack the objective healing of tennis elbow.

## CONCLUSION

PRP is effective in terms of pain and improvement of function of elbow. It is cost effective, is a simple technique, is safe and minimally invasive. Although literature show some controversies about the benefits of PRP in tendinopathies but still the regenerative medicine has open a new window for restoration of tissue with tendinopathies.

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