

Clinical and Magnetic Resonance Imaging Outcomes Following Platelet Rich Plasma Treatment for Elbow Tendinosis

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Abstract

Back Ground: Platelet Rich Plasma is now being utilized for patients with tendinosis and arthritis. This treatment option in many instances has replaced the need for surgery.

Hypothesis: The purpose of this study was to investigate if Platelet Rich Plasma (PRP) treatment of elbow tendinosis is associated with improved clinical outcomes with respect to pain, function and return to sports/recreation. Also to determine if an MRI would detect any significant structural changes of the tendon after treatment.

Study Design: Prospective case series, Level of Evidence: IV

Methods: This study evaluated 114 patients treated with PRP for either lateral or medial elbow tendinosis. Tendinopathy was confirmed with a baseline MRI in all patients. Subjects completed serial visual analog scales (VAS) to assess pain, elbow function and sports/recreational activity levels at 6 and 12 months post-injection. An additional retrospective score was recorded approximately 24 months post-injection. 17 patients had post-treatment MRIs between 6 months and 1 year to assess healing.

Results: The average age of patients was 51.9 years with 43% (49) females and 57% (65) males. Extensor Tendinosis was diagnosed in 65% (74) and flexor tendinosis in 35% (40) patients. VAS pain scores at 6 months were reduced significantly (61%) and at 1 year (69%) from baseline, with a 2 year (83%) reduction ($p < 0.001$). Functional scores at 6 months increased significantly (64%) at 6 months and at 1 year (76%) from baseline with maintenance at 2 years of a (77%) improvement ($p < 0.001$). Sports/recreational level scores at 6 months increased significantly (81%) and at 1 year (165%) from baseline, with a 2 year (107%) improvement ($p < 0.001$). No differences in outcomes were noted between medial versus lateral tendinosis. MRI in a limited number of patients compared to baseline demonstrated an improvement in the appearance of tendinosis (47.19%) and partial tears (44%).

Conclusion: PRP treatment for lateral or medial elbow tendinosis resulted in significant improvements in pain levels, elbow function and sports/recreational activities. This study suggests that PRP may improve clinical outcomes for up to two years.

Clinical Relevance: Yes

Key Words:

Elbow Tendinosis; Platelet Rich Plasma; Magnetic Resonance Imaging; Tennis Elbow; Golfers Elbow

Introduction

It has been demonstrated in the literature that a high number of cases of medial or lateral elbow tendinosis persist with symptoms even after appropriate conservative management. This has encouraged the use of biological management adjuncts, such as platelet rich plasma (PRP) [1,6]. The purpose of this study is to establish whether there is a correlation between PRP treatments and clinical outcomes for pain, function, and sports/recreation levels. The study also aims to investigate whether PRP therapy for either lateral or medial tendinosis is associated with changes in tendon structure, as measured by MRI [7,8].

Case Report

We prospectively collected data for 114 consecutive patients who received a single injection of PRP into either the extensor tendons or the flexor tendons of the elbow. All patients reported lateral or medial epicondylar elbow pain of an average of 11 months duration, with 44 patients complaining of pain for greater than 1 year. All patients had failed a course of physical therapy and had never previously been treated with PRP. Medial or lateral tendinosis, or partial tendon tears were confirmed for all patients with an MRI prior to treatment. All PRP samples were prepared using the Cascade Autologous Platelet System, as per the manufacturer's instructions and injected under ultrasound guidance with a peppering technique.

Patients completed serial visual analog scales (VAS) assessments at baseline, six and twelve months. An additional retrospective score was recorded approximately 24 months post-injection. While 114 patients

were initially recruited into the study, 84 patients were assessed for final analysis. The other 30 patients were not included: 12 received a second PRP injection during the study period; 3 had a surgical intervention, 1 of which was from re injury; and 15 had incomplete data.

Follow-up data was obtained for 35 patients (42%) at 6 months, 22 patients (26%) at 1 year and 43 patients (51%) at 2 years of the 84 patients assessed.

All MR examinations were graded by the consensus opinion of two musculoskeletal radiologists who were blinded as to whether the examination was performed pre-treatment or post-treatment.

Data Analysis

Descriptive statistics were calculated in terms of means and standard deviations for continuous variables and frequencies and percentages for categorical data. Longitudinal assessment of overall pain, function, and sport levels were evaluated using paired-tests for baseline scores 6-, 12-, and 24-month follow ups. To adjust for multiple comparisons, Bonferroni's adjustment was applied so p-values less than 0.017 were considered statistically significant. A post hoc power analysis determined that the 22 patients who had complete information at 12-month follow up achieved greater than 80% power to detect a mean 2-point change in VAS outcomes with an adjusted significance level set to alpha equal to 0.017. Associations between changes in MRI appearance prior to and following PRP treatment were assessed using a chi-square or Fisher's test. All analyses were conducted using PASW Statistics version 18.0 (SPSS Statistics, Inc., Chicago, IL).

The average age of patients was 51.9 years with 43% females (N = 49) and 57% males (N = 65). Extensor tendinopathy (lateral epicondylitis) was diagnosed in 74 elbows and flexor tendinosis was found to affect 40 elbows based upon clinical symptoms and MRI evaluation.

A 61% reduction in mean baseline VAS pain scores was seen at six months (from 3.914 to 1.514, $p < 0.001$), a 69% improvement at 1 year (3.818 to 1.182, $p < 0.001$, and an 83% improvement at 2 years ($p < 0.001$) [Figure 1]. At 2 years, 41 out of 43 patients (95%) showed at least a 25% decrease in VAS pain scores. However, there was no significant difference in VAS pain scores between 6 to 12, and 12 to 24 months ($p > 0.05$).

Functional scores from baseline showed a 64% increase at 6 months (from 4.794 to 7.882, $p < 0.001$), a 76% improvement at 1 year (4.722 to 8.333, $p < 0.001$) and a 77% improvement at 2 years ($p < 0.001$) [Figure 1]. Again, no significant difference was detected in functional scores between 6 to 12, and 12 to 24 months ($p > 0.05$).

A similar trend was seen for sport/recreational levels, with a mean improvement from baseline of 81% at 6 months (from 3.758 to 6.818, $p < 0.001$), a 165% improvement at 1 year (2.824 to 7.471, $p < 0.001$), and a 107% improvement at 2 years ($p < 0.001$) [Figure 1]. Sports/recreational levels did not significantly differ between 6 to 12, and 12 to 24 months ($p > 0.05$).

Seventeen patients underwent MRI prior to PRP treatment and at 6 or 12 months post PRP-treatment. On the pre-treatment MRI, 5 (29.4%) patients had mild tendinosis, 9 (52.9%) had moderate tendinosis, 3 (17.6%) had severe tendinosis. Additionally, partial thickness tears were present in 9 (52.9%) patients, while 8 (47.1%) patients had no tears Overall; there was a 47.1% (8 patients)

improvement in the post-treatment MRI grading of tendinosis (Table 1). While PRP appeared to have a greater effect on improving the MRI appearance of moderate and severe tendinosis rather than mild tendinosis, these conclusions are based upon a small number of cases only. Of the 9 patients with partial tears at baseline, a repeat MRI 6-12 months after PRP treatment showed that 4 (44.4%) improved and 5 (55.6%) partials tears remained unchanged, suggesting that some partial tendon tears did improve on the post-treatment MRI , 2 (25%) patients who did not have tears at baseline developed tears between 6-12 months after PRP injections.

Changed in MRI appearance	Total Tendinosis	Mild Tendinosis Frequency (%)	Moderate Tendinosis Frequency (%)	Severe Tendinosis Frequency (%)
Improved	8 (47.1%)	1 (20%)	5 (55.6%)	2 (66.7%)
No Change	8 (47.1%)	3 (60%)	4 (44.4%)	1 (33.3%)
Worsened	1 (5.9%)	1 (20%)	0	0
Total	17	5	9	3

Table 1: Change in the MRI appearance of elbow tendinosis between 6-12 months and baseline after PRP treatment.

Discussion

This retrospective study found that patients treated with a single PRP injection for either extensor or flexor tendinopathy of the elbow reported a significant reduction in VAS pain scores at 6 months, 1 and 2 years, compared to baseline levels. Functional scores and sports/recreational participation also showed significant improvements at 6 months and 1 and 2 years compared to baseline values. However, in the absence of a control group it is difficult to interpret whether PRP treatment produced superior clinical outcomes. A small subset of patients with follow up MRIs (a weakness of the study) demonstrated a decrease in the extent of tendinosis and partial tears.

The effects of PRP on chronic lateral epicondylitis were evaluated by a double blinded randomized control trial, in comparison to corticosteroid treatment [2,5]. Successful outcomes were defined as a 25% reduction in VAS or DASH scores without re intervention after one year. While both groups reported a significant improvement in symptoms, the PRP treatment was associated with a significantly greater 73% reduction in VAS scores compared to the 49% reduction associated with corticosteroid treatment.

PRP mediated improvements appeared to persist at both 6 months and 2 years, unlike the corticosteroid mediated effects. Our results, as other studies [3,4], indicate that patients can expect symptomatic and functional improvement following the use of a single injection of PRP for chronic tendinosis as pain, function, and sports/recreational participation improved for up to 2 years from baseline.

A greater number of adequately powered, randomized double-blind controlled trials are required to determine the efficacy of PRP treatment for elbow tendinosis and/or tears. Superior efficacy of PRP treatment over other conservative or surgical treatment options requires further investigation. Ideally future studies will involve standardized clinical assessment of functional outcomes, biological characterization of the PRP, and include structural imaging of any changes in tendon healing. The optimum PRP formulation has not been identified. Different preparations systems produce varying PRP

concentrations, cellular components, volumes, and utilize different activation techniques that make it difficult to compare clinical outcomes using different commercial systems.

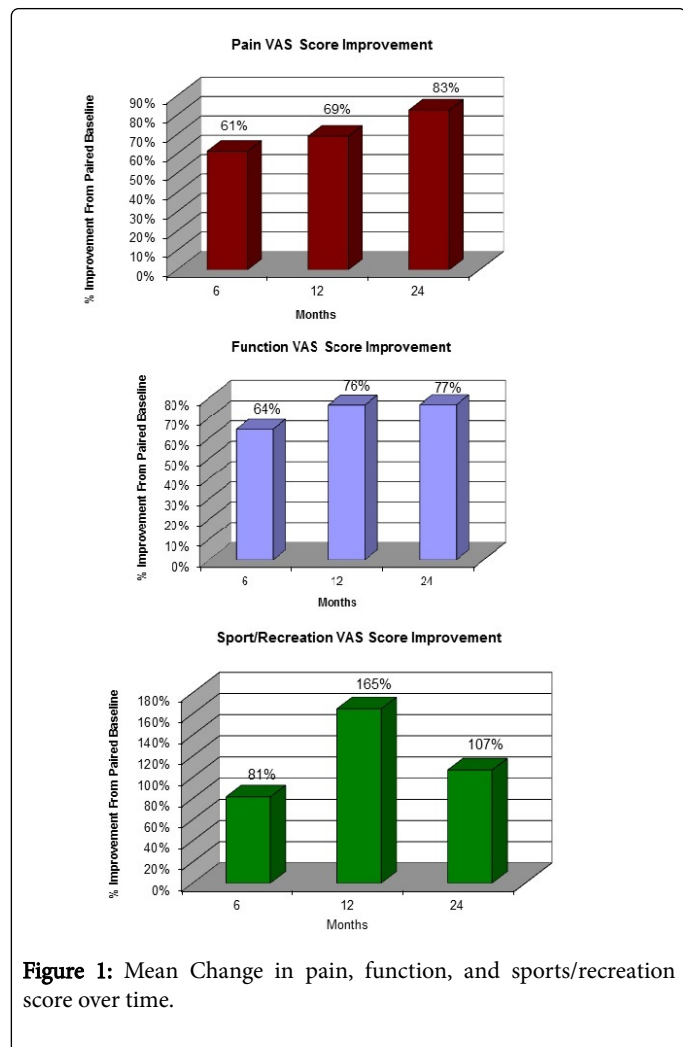


Figure 1: Mean Change in pain, function, and sports/recreation score over time.

This study was limited by the absence of a control group. Another limitation is that a high number of patients were lost to follow-up. Even with the reduced numbers for clinical follow up at one year, post-hoc power analyses confirmed that our study still had greater than 99%

power to detect significant differences in subjective outcome measures of VAS pain, function, and sport/recreation scores, with an adjusted significance level of alpha equal to 0.017. Only a subset of the patients underwent follow up MRIs and the study was underpowered with respect to detecting changes in MRI appearance.

Conclusion

This study demonstrated that following PRP treatment for lateral or medial elbow tendinosis, or partial tears, patients reported significant improvements in pain levels, elbow function and sports/recreational activities compared to baseline properties. Improved MRI appearance of tendinosis and partial tears was also detected in the subset of patients with follow-up MRIs. Results from this study can be used to guide patient expectations following PRP therapy. This study suggests that PRP may play a role in improving clinical outcomes in patients with chronic extensor or flexor tendinosis of the elbow for up to two years.

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