

Evaluation of the Results of Platelets Rich Plasma Local Injection in Achilles Tendinopathy

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ABSTRACT

Background: Platelets rich plasma (PRP) is a new frontier in the treatment of orthopedic injuries in the growing science of orthobiologics or the science of injectables to promote healing through the use of the patient's own biological tissues. Local subacromial injection of PRP is a useful procedure, good, efficient, and safe for the treatment of patients with Achilles tendinopathy. **Patients and Methods:** A total of 20 patients received local PRP injection followed by postinjection rehabilitation program. All patients completed a follow-up period of 6 months and assessed subjectively as regard the modified American Orthopaedic Foot and Ankle Society ankle-hindfoot scale and objectively using sonographic evaluation. **Results:** Fourteen of the 20 patients (70%) in this study achieved satisfactory results and 2 of them (10%) were classed excellent. **Conclusion:** Local Achilles tendon injection of PRP is a useful procedure, good, efficient, and safe for the treatment of patients with Achilles tendinopathy.

Key words: Achilles tendon, platelet-rich plasma, tendinopathy

INTRODUCTION

The performance impairment in active subjects connected with pain in the posterior surface of the distal calf and heel area is related to various Achilles tendon pathology syndromes.^[1]

The location and character of pathological lesions vary. The etiology of the condition is most frequently associated with overload in middle-aged subjects.^[2]

Pathological processes are frequently localized 2–6 cm above the tendon-bone junction.^[3]

The incomplete understanding of the variable nature of pathological lesions observed in the course of these processes has led to persistent controversy over treatment methods and even nomenclature.^[4,5]

Inflammatory lesions are rarely seen in clinical imaging and histological examinations. These most frequently involve the peritendineum and are frequently asymptomatic.

Lesions involving fatty or mucinoid degeneration within the peripheral section of the Achilles tendon proved to be the cause of complaints.^[5-7]

For many years, the belief of an inflammatory etiology has caused systemic and topical anti-inflammatory treatment to be the principal therapy. Since this treatment frequently proved to be ineffective, other solutions needed to be sought, both surgical and non-surgical. Nevertheless, it remains unclear, which of the suggested treatments are more effective.^[8-10]

Platelets rich plasma (PRP) injection stimulates natural healing through growth factors in the platelets. It accelerates the physiological healing process, provides support for the connection of cells, reduces pain, and has an anti-inflammatory and antibacterial effect.^[11] Obtaining PRP growth factors are simple and cheap,^[12] it is autogenous, easy to prepare, and has an excellent reliability profile.^[13]

More than 30 bioactive proteins are found within the alpha granules of platelets.^[13] Growth factors (such as platelet-derived growth factor, transforming growth factor,

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vascular endothelial growth factor, and insulin-like growth factor) and proteins (such as fibrin, fibronectin, vitronectin, and thrombospondin) in PRP play an important role in many stages of tissue healing.

The aim of the study was to evaluate the results of PRP local injection in Achilles tendinopathy.

PATIENTS AND METHODS

A total of 20 patients with Achilles tendinopathy were included in the study, 12 women and eight men. Patients with foot deformity, vascular insufficiency or neuropathy related to heel pain, other painful or functional limited disorders of the foot and ankle, pregnancy, history of severe anemia (hemoglobin < 5), and rheumatic arthritis were excluded from the study. The youngest patient was 19 years and the oldest was 62 years with a mean age of 44.85 years. 11 patients suffered from the right side while nine patients suffered from the left side. The shortest duration of suffering from symptoms was 2 months, while the longest was 9 months with mean period of 3.80 ± 2.02 months. All the included patients in the study had previous unsuccessful treatment with NSAIDs. The mean body mass index (BMI) of all patients was 25.8, 14 patients (70%) were >25 and 6 (30%) were <25. There were 4 (20%) athletes and 16 (80%) non-athletes.

Patient received PRP injection using 12 ml of venous blood withdrawn in Vacutainer tubes containing Na citrate 3.2% anticoagulant. The platelet count in the samples was measured using Abbot Emerald automatic hematology analyzer, then the tubes were centrifuged at a slow speed for short time (soft spin) to separate the blood cells from plasma containing the platelets (separation spin) using benchtop centrifuge (Du Pont Sorvall TC-6 centrifuge, USA), supernatant plasma, and part of buffy coat layer containing platelets were separated from the cells using sterile pasteurs and then transferred into sterile plain tubes (without anticoagulant). The tubes were centrifuged at a higher speed (a hard spin) to obtain a platelet concentrate (concentration spin). At the bottom of the tube, platelet pellets were formed. The lower part is PRP and upper part is platelet-poor plasma (PPP). We removed PPP and resuspended the platelet pellet in the volume of plasma left to have the PRP. Platelet was counted in the PRP to calculate the concentration factor. Finally, PRP was delivered to a sterile needle for injection [Figure 1].^[14,15]

The patient lies prone with foot held in dorsiflexion over end of bed [Figure 2]. This keeps the tendon under tension and facilitates the procedure. The tender area of tendon is identified which usually present along the sides, the needle inserted on the medial side and angled parallel to tendon. Sliding the needle alongside of the tendon, taking care not to enter into tendon itself, half solution was deposited while slowly withdrawing needle. Then, the needle was inserted on lateral side and the

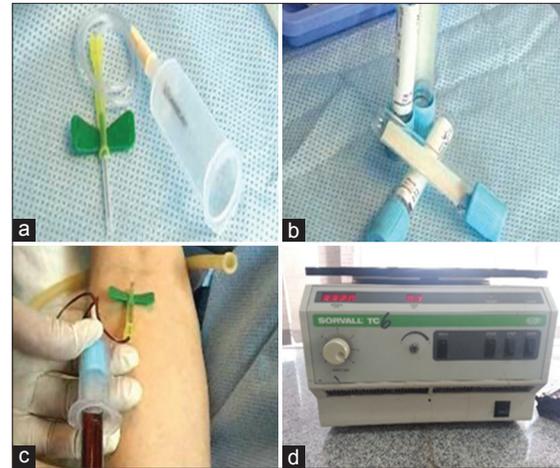


Figure 1: (a) Vacutainer holder. (b) Vacutainers with sodium citrate 3.2%. (c) Blood was withdrawn in Vacutainers. (d) Centrifuge



Figure 2: Platelets rich plasma injection; patient lies prone with foot held in dorsiflexion over end of bed

procedure is repeated with remaining half of solution. Sterile dressing was applied for site of injection. The patient was then observed for 15–20 min and then discharged.^[16]

All patients assessed and followed up for at least 6 months using the modified American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot scale [Table 1].^[17]

A score of >90 points was considered excellent, 80–89 was good, 70–79 was fair, and <70 was poor, excellent and good were considered satisfactory while fair and poor were unsatisfactory. Ultrasonographic evaluation was used before injection and at the final follow up for all patients.

RESULTS

At the end of the follow-up period, the mean AOFAS ankle-hindfoot scale was 79.75, 14 of the 20 patients (70%)

Table 1: The modified American Orthopaedic Foot and Ankle Society ankle-hindfoot scale

Pain: 40	Function: 10
None	40
Mild, occasional	30
Moderate, daily	20
Severe, almost always present	0
Function	
No limitation, no support	10
No limitation, no support, limitation of recreational activities	7
limitation of daily and recreational activities	4
Severe limitation of daily and recreational activities, crutches, wheelchair	0
Maximum walking distance (m)	5
>600	5
400–600	4
100–300	2
<100	0
Walking surfaces	5
No difficulty on any surfaces	5
Some difficulty on uneven terrain, stairs, inclines ladders	3
Severe difficulty on uneven terrain, stairs, inclines ladders	0
Gait abnormalities	8
None, slight	8
Obvious	4
Marked	0
Sagittal motion (flexion, extension)	8
Normal	8
Restriction 15°–29°	4
Restriction <15°	0
Hindfoot motion(inversion, eversion)	6
Normal	6
Moderate restriction (25%–74% normal)	3
Marked restriction (<25% normal)	0
Ankle-hindfoot stability (anterior-posterior, varus-valgus)	8
Stable	8
Unstable	0
Alignment	10
Good	10
Fair	8
Poor	0
Total score	100

in this study achieved a satisfactory results [Table 2], 2 patients (10%) had excellent results, 12 patients (60%) had good results, 3 patients (15%) had fair results, and 3 patients (15%) had poor results. Limitation of activity was absent in 60%, minor in 35%, and major in 5%. Antalgic gait was absent in 70%. Pain was absent in 30% of treated feet, mild in 40%, moderate in 20%, and severe in 10%.

As regarding US findings of patients with Achilles tendinopathy, US showed a slight improvement in tendinopathy, tendon thickness, and tendon girth.

There was statistically significant relationship between pain; $P = 0.001$ and ultrasound evaluation; $P = 0.013$ and final score while non-significant relationship encountered with final score as regarding age, sex, occupation, BMI, and duration of symptoms ($P = 0.254$, $P = 0.331$, $P = 0.458$, $P = 0.243$, $P = 0.525$), respectively.

As regarding complications, there is no recorded complication after injection or at the end of the follow-up period.

DISCUSSION

Tendinopathy is a broad term that is used to describe disorders in and around tendons, Tendinitis, tendinosis, and paratenonitis all examples of tendinopathy. Tendinopathy can be associated with a variety of intrinsic and extrinsic factors. Histopathologic studies on chronic tendinopathy have shown major disorganization and loosening of collagen fibrils.^[18-22]

The imaging modalities that are used most commonly in the diagnostic evaluation of the Achilles tendon include conventional radiography (X-ray), ultrasonography (U/S), and magnetic resonance imaging.^[23-25] In this study, we used U/S for evaluation of the tendon preinjection and at the final follow-up for all patients.

Researchers have documented that PRP has 4–6 times the normal level of growth factors, which results in fibrocytes migration and induction of neovascular growth.^[26] Peerbooms *et al.*^[27] found a positive effect of injection of PRP in the common extensor origin for lateral epicondylitis.

The use of autologous PRP is not a new treatment. The healing cascade is well documented and relies on proteins that are delivered to the healing site.^[28] Successful tissue healing and regeneration require a scaffold or matrix, undifferentiated cells, and signal proteins and adhesion molecules (growth factors). It is well known that platelets affect mitogenic activity of cells like osteoblast, chondroblast, or tenoblast.^[29] It was proved that injection of PRP into the affected tissues addresses the healing stages necessary to reverse the degenerative process which are going on in the Achilles tendon.^[30,31]

Table 2: Patient satisfaction

Patient satisfaction	n (%)
Unsatisfactory	6 (30.0)
Poor	3 (15.0)
Fair	3 (15.0)
Satisfactory	14 (70.0)
Good	12 (60.0)
Excellent	2 (10.0)
Score	
Min.-Max.	60.0–95.0
Mean±SD	79.75±8.81
Median	82.50

At the end of follow-up, the mean score was 79.75. 14 (70%) were satisfied and 6 (30%) were unsatisfied, 2 (10%) were excellent, 12 (60%) were good, 3 (15%) were fair, and 3 (15%) were poor. These results were comparable to the results of other studies, Ferrero *et al.* showed good results at the 6-month evaluation in 24 patients treated with a single injection of PRP. Besides, the good clinical outcome, follow-up US scans were also performed and revealed a widespread improvement in the fibrillar echotexture of the tendon and reduced hypervascularity as shown by U/S, and this is consistent with our study.^[32]

We found that the clinical improvement was stable and maintained up to a 6-month follow-up. Clinical improvement was significantly slower in patients with a higher pre-treatment symptom level, and the return to sport was more difficult in patients with a longer history of symptom. Pain was absent in 30% of treated feet, mild in 40%, moderate in 20%, and severe in 10%. This is consistent with those of Sánchez *et al.*^[33]

Patients with Achilles tendinopathy are usually middle aged.^[5,34] In this study, the mean age was 44.85. The satisfactory results were observed in patients of younger age group. The mean age with satisfactory results was 41 years, ranging from 19 to 56 years. This may be due to the better ability of the tissues in the younger age group to heal than older age groups. Most available literatures have not mentioned the possibility of affection of the results of treatment by age.

Kulmala *et al.* observed that males were associated with significant increases in Achilles tendon force and rates of loading. This finding may be relevant clinically for the pathogenesis of Achilles tendinopathy and provide insight into the mechanism by which males athletes suffer from increased incidence of Achilles tendon pathology.^[35] Females in this study represent 60% of all patients, this difference may be due to most of the patients in this study were non-athletes.

We observed that 70% of the satisfactory results were in females, but we did not find mention of this relationship in other studies.

Overweight and obese patients were 2.6–6.6 times more likely to present with Achilles tendinitis than those with normal BMI. An elevated risk of presenting with Achilles tendinitis was also noted at higher BMI categories. However, BMI did not appear to affect treatment outcomes.^[36,37] Those findings were agreed with this study where 14 (70%) patients had have a BMI ranging from 21 to 29 with mean 25.80, and it had no significant effect on the final outcome.

Although PRP is a hot topic now in the field of orthopedic medicine, the large controlled, double-blind scientific studies to validate its effectiveness are needed. We have some limitations in a study where it was a randomized prospective study with no control group, short duration of follow-up and the excluded group.

CONCLUSION

PRP preparation is an inexpensive and non-complicated procedure. It is effective and durable for the treatment of Achilles tendinopathy. It is safe in the treatment of Achilles tendinopathy.

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How to cite this article: Abdullah EA, Ali M. Evaluation of the Results of Platelets Rich Plasma Local Injection in Achilles Tendinopathy. *Clin Res Orthop* 2018;1 (1):1 5.