Acta Orthopaedica et Traumatologica Turcica xxx (2017) 1–6

Contents lists available at ScienceDirect

Acta Orthopaedica et Traumatologica Turcica

journal homepage: https://www.elsevier.com/locate/aott

Peritendinous injection of platelet-rich plasma to treat tendinopathy: A retrospective review

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ARTICLE INFO

Article history:
Received 18 July 2017
Received in revised form
18 September 2017
Accepted 12 October 2017
Available online xxx

Keywords:
Platelet-rich plasma
Tendinopathy
Injection
Achilles tendon
Patellar tendon
Lateral epicondylitis

ABSTRACT

Objective: The aim of this study was to determine factors associated with the likelihood of a better clinical outcome after the peritendinous injection of PRP for the treatment of chronic tendinopathy and identify whether PRP represents an effective treatment option for chronic tendinopathies.
Methods: The study included 214 patients (86 males and 128 females; mean age: 39.3 (18–75) years) who received PRP injections for tendinopathy refractory to conventional treatments. The mean duration of symptoms at the moment of the PRP treatment was 8.3 months. Primary outcome measurement was perceived improvement in symptoms for each anatomic compartment for upper and lower limbs at 6 months after treatment. Also, a visual analog scale (VAS) score (pain intensity on a 0–10 scale) was used for pain scoring questionnaire before treatment, 6 weeks and 6 months following the PRP injection(s). To identify factors associated with the likelihood of a better clinical outcome, patients were categorized on the basis of their perceived improvement in symptoms 6 months after the PRP injection(s)—that is, as lower (less than 50% global improvement) or higher (more than 50% global improvement).
Results: A visual analogue scale score and perceived improvement in symptoms were significantly lower after peritendinous injection in 6-week and 6-month follow-ups compared with the baseline ($P < 0.001$) except for peroneal and Achilles tendons. Overall, 83% of patients indicated moderate to complete improvement in symptoms. The most common injection sites were the lateral epicondyle, Achilles, and patellar tendons. Furthermore, 30% of patients received only 1 injection, 30% received 2 injections, and 40% received 3 or more injections. A total of 85% of patients were satisfied (more than 50% global improvement) with the procedure. In addition, upper limb tendons, increase in the age, and female gender were associated with a higher likelihood of perceived improvement in symptoms.
Conclusions: In the present retrospective study assessing PRP injections in the treatment of chronic tendinopathy, a moderate improvement (>50%) in pain symptoms was observed in most of the patients. Our research found that results were most promising with patellar and lateral epicondylar tendinopathy in the short to medium term. Female patients, patients with upper extremity tendinopathy and older patients appeared to benefit more from PRP injection.
Level of evidence: Level IV, Therapeutic study.

Introduction

Tendon pain is frequently observed in professional and recreational athletes, in addition to sedentary individuals.[1,2] Tendon injuries are classified as tendinitis in the acute inflammatory process and tendinosis in the case of the chronic impairment of healing, indicated by the scarcity of inflammatory cells in the tissue, collagen degeneration, abnormal tissue repair, thickening of the tendon, and neovascularization.[2] The term tendinopathy is used by

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Peer review under responsibility of Turkish Association of Orthopaedics and Traumatology.

https://doi.org/10.1016/j.aott.2017.10.003

Please cite this article in press as: Unlu MC, et al., Peritendinous injection of platelet-rich plasma to treat tendinopathy: A retrospective review, Acta Orthop Traumatol Turc (2017), https://doi.org/10.1016/j.aott.2017.10.003

clinicians at an increasing rate for the purpose of referring to tendon disorders without indicating a particular pathology and chronic tendinopathy for cases that are hard to treat by means of conventional treatments.

Ice, rest, activity modification and anti-inflammatory medications are generally included in the current mode of management. The reasons for the above-mentioned treatments have been questioned in recent times. An increase in the activity of the collagen-degrading enzymes, indicating a detrimental impact on tendon healing, was demonstrated in a study conducted on the impact of ibuprofen on rat Achilles tendon cells.[3] Peritendinous injection of corticosteroid is widely used for the treatment of tendinopathy, although inflammation is absent in the above-mentioned condition and there is the risk of tendon atrophy or secondary rupture.[4]

Platelet-rich plasma (PRP) is being utilized at an increasing rate for the promotion of musculoskeletal healing by stimulating angiogenesis, cell proliferation, and chemotaxis.[5] It has been demonstrated that PRP promotes healing in cases of tendinous and ligamentous injury and muscular strain,[6–8] and it has been utilized for the purpose of shortening the recovery period and return to play (RTP) duration.[9]

It has been suggested that platelet-rich plasma (PRP) injections are a promising option for the treatment of tendinopathies. In tendinopathy, the failed-healing hypothesis suggests that repetitive stresses lead to small injuries within the tendon that fail to heal before further trauma occurs. Difficulties in achieving healing arise in tissues characterized by a low cell number and low extracellular matrix turnover.[10] Thus, broadly speaking, tendon regeneration can be achieved by increasing cell numbers and/or enhancing tendon cell anabolism (collagen synthesis).

However, there are a limited number of scientific studies demonstrating the effective treatment of tendinopathy by means of PRP injections. The majority of studies are case series reports with small sample sizes, and contradictory results have been obtained in randomized control trials.[6,8,11,12] This study aims to identify whether peritendinous injection of PRP can be used effectively to chronic tendinopathy and also to determine factors associated with the likelihood of a better clinical outcome. The identification of patient characteristics that predict clinical outcome can be helpful in the development of patient-specific treatment strategies. It will also help provide better information and more realistic expectations for various tendinopathies.

Patients and methods

In this retrospective, single-site, descriptive study, we analyze the clinical results of the peritendinous PRP injection for the treatment of tendinopathies. The Institutional Ethics Board approved this study. 248 consecutive patients with persistent tendinopathy who referred to our institution for a PRP treatment after the initial conservative treatment failure between January 2010 and September 2014 were included in the study. The medical records of all patients were reviewed retrospectively. The following inclusion criteria were determined: male and female subjects with a diagnosis of tendinopathy for more than 3 months that had not resolved by applying conventional treatments, such as oral medications, physiotherapeutic modalities, and eccentric exercises (those involving slow, controlled lengthening of the muscle/tendon unit), among others. To make a diagnosis, the patients should have documented pain upon palpation over the tendon, pain with resisted activation of the tendon, and ultrasound or magnetic resonance imaging findings should have been consistent with tendinopathy. The exclusion criteria were additional treatment after PRP injection during follow-up (either medical or surgical), incomplete data, or loss to follow-up. A total of 214 patients (86 males and 128 females) matched these criteria.

PRP preparation and injection technique

20 ml of peripheral blood in total was drawn from all patients into four 5 ml trisodium citrate tubes, and the preparation of a PRP concentrate was performed by a validated method leading to a 29–39 fold increase in platelet concentration without leucocytes.[13] Centrifugation of tubes was conducted with a single spin, at 460 g for the period of 8 min. Under laminar airflow, the plasma fraction exactly above the buffy coat (1.5 ml) was aspirated from all tubes and dispensed into an empty tube. The addition of 22.8 mM of calcium chloride into the solution was performed before the injection. Following this, the activated concentrate was injected as the needle was gradually withdrawn towards the skin into the peritendinous area before coagulation.

The determination of the number of PRP injections had to be performed in accordance with the certain criteria. In case of (1) 80% global improvement stated by the patient, no further injection was suggested; (2) less than 80% global improvement stated by the patient but improvement still continuing, no further injection was suggested; and (3) less than 80% global improvement and plateaued in progress, further injections were suggested.

Lateral and medial epicondyle

The prepared 3 ml of PRP was injected with an 18-gauge needle into the common extensor or flexor tendon as well as the insertions into bone, using a peppering technique. This technique involved a single skin portal followed by 5 penetrations of the fascia while injecting equal amounts of platelet-rich plasma. Injections were administered at the point where maximal pain was present.

Patellar tendon

Approximately 2 ml of PRP was injected directly into the area of maximum tenderness. Then the remaining 2 ml PRP was injected by the investigator using an 18-gauge needle into the patellar tendon origin on the patella with a peppering technique. This technique involved a single skin portal and then five penetrations of the tendon.

Rotator cuff

Approximately 5 ml of PRP was injected under the posterolateral aspect of the acromion, directly into the subacromial space. No repeated needling (tenotomy) was done.

Achilles

Approximately 3 ml–5 ml of PRP was injected into the Achilles tendon using a peppering technique always in local anesthesia, with patient prone. This technique involved a single-skin portal followed by five penetrations of the tendon.

Hamstring

The patient was positioned in a lateral decubitus or prone position. An 18-gauge spinal needle was inserted through the skin. The needle was directed toward the ischial tuberosity using direct palpation. The needle was then withdrawn a few millimeters, and approximately 3 ml–5 ml of PRP was administered into the muscle origin.

Gluteus medius

Point of maximal tenderness identified on the lateral aspect of the greater trochanter. A 22-gauge spinal needle was advanced perpendicular to the skin to the level of bony contact, then withdrawn 2 mm; approximately 3 ml–5 ml of PRP were injected.

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