

Effect of platelet-rich plasma therapy in conjunction with physical therapy for rotator cuff tendinopathy

Objective: To evaluate the effect of combining ultrasound-guided Platelet-Rich Plasma (PRP) therapy with physical therapy for rotator cuff tendinopathy.

Design: We present a case report of rotator cuff tendinopathy treated with ultrasound-guided Platelet-Rich Plasma (PRP) injections followed by physical therapy.

Methods: After undergoing conventional treatment modalities, a patient underwent a course of ultrasound guided PRP injection followed by physical therapy (core strengthening) for 10 weeks. The patient outcome was measured using the numerical Pain Rating Scale (NPRS), Oxford Scoring System (OSS), and the Western Ontario and McMaster Universities Arthritis (WOMAC) Index. Radiological examination using Magnetic Resonance Imaging (MRI) was also performed before and after PRP treatment.

Results: Following treatment, the patient reported pain relief within a week. As the patient continued core strengthening exercise for 10 weeks, he showed drastic improvement in function with no pain and discomfort as determined by NPRS, OSS, and WOMAC index respectively. At the same time, there were no significant complications. Even the repeat MRI performed after 18 m showed no supraspinatus tendinopathy tear.

Conclusion: In this case report, PRP injections in combination with physical therapy for the treatment of rotator cuff tendinopathy demonstrated improvement in all outcome measures. This highlights the need for conducting more controlled trials to determine the effect of this combinational treatment.

Keywords: platelet-rich plasma therapy • conjunction • physical therapy • rotator cuff tendinopathy

Introduction

Background

Rotator cuff tendinopathy is believed to be the most common cause of shoulder pain. A cross-sectional study revealed that 86 percent of all clinical diagnoses of shoulder pain were that of rotator cuff lesions [1]. The occurrence of rotator cuff disease, especially partial and full thickness rotator cuff tears, escalates starting at the age of 40 years and may reach high up to 50% by the age of 70 y [2].

Partial tears and early tendinosis can be usually treated with rest, activity modification, physical therapy, analgesics/non-steroidal anti-inflammatory drugs (NSAIDs), and corticosteroid injections [3]. Even surgical

intervention has a variable outcome that gets complicated by a lengthy recovery to return to the pre-injury activities. Still, there is no satisfactory treatment available that can improve degenerative pathology of rotator cuff tendinopathy clinically, functionally, radiologically, and histologically [4].

Recently, Singh *et al.*, recommended that orthobiologics plays a vital role in rotator cuff syndrome [5]. Platelet-Rich Plasma (PRP) as a better biological solution to heal the affected rotator cuff tendon has gained acceptance over the past few years [6]. Autologous PRP consists of a high concentration of platelets with varied bio-active substances including VEGF, TGF- β , IGF1, alfa granules, etc., and

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growth factors. It takes part in repairing the tissues naturally and enhances tissue regeneration [7]. PRP therapy has several advantages over other treatments in terms of cost-effectiveness, easy production, and relative safety [2].

In a pilot study, Wesner et al. Stated improvements in pain, function, as well as tendon pathology by undergoing ultrasound guided PRP injection [8]. Another research study revealed that a single dose of PRP injection can effectively decrease pain and improve the range of movements in patients with partial rotator cuff tear who did not respond to conservative treatments [9]. Furthermore, patients undergoing PRP therapy reported no adverse side effects [10].

Hence, this case study describes the successful use of autologous PRP in conjunction with physical therapy in the treatment of rotator cuff tendinopathy.

Case presentation

A 34-year-old male presented to a Medica Stem Cells Clinic with painful right shoulder pain while lifting the arm and performing an external rotation.

Formal radiological assessment using Magnetic Resonance Imaging (MRI) showed evidence of mild supraspinatus tendinopathy with no tear and mild bursitis.

The initial pre-existing conservative management programme included physical therapy exercises such as ROM (Range of Motion) exercises, pendular swing, assisted hand behind your back, self-assisted flexion, sling, stick assisted lateral rotation, and abduction in the preceding 3 m. In addition, Naproxen (1000 mg) and Neurofen (Non-Steroidal Anti-Inflammatory Drugs (NSAIDS) (400 mg) were being taken twice daily. The patient had no significant improvement in pain for the past 10 m.

The patient then visited Medica stem cells, requested advice on possible non-surgical treatments for his right shoulder pain, and made detailed enquiries regarding platelet-rich plasma injections. A piece of written information and education were provided regarding PRP and its use within rotator cuff tendinopathy, including appropriate alternatives and probable risks involved. Given that the patient had radiologically proven shoulder tendinopathy, failed conservative treatments and was otherwise fit, he was evaluated as a suitable candidate for the trial of ultrasound guided PRP. A formal written informed consent was received from the patient prior to commencement of treatment.

Investigations

Radiological examination using magnetic resonance imaging (MRI) confirmed mild supraspinatus tendinopathy with no tear and mild bursitis.

Treatment

PRP preparation

Autologous PRP was prepared using a Yellow-top Tube Double Spin Method where the platelet count in the PRP will be $12.51 \pm 5.89 \times 10^5/\mu\text{L}$ [11, 12].

Autologous blood (25.5 mL) was withdrawn from the patient via venepuncture and collected in 3 × 8.5mL BD Vacutainers (Catalog#364606; Becton-Dickinson, Franklin Lakes, New Jersey, USA) containing ACD (citric acid 8.0g/L, trisodium citrate 22.0 g/L, and dextrose 24.5 g/L) to stop clotting. With the help of a benchtop centrifuge, the collected blood underwent an initial spin at 1000 rpm for 10 m to develop a Platelet-Poor Plasma (PPP) level, a middle buffy coat level (rich in platelets and leucocytes), and a red blood cell layer.

1 cc to 2cc of the Platelet-Poor Plasma (PPP) and the buffy coat were withdrawn to the level of the red blood cell layer. They were then kept in a sterile vacutainer, and it underwent a second hard spin at 3500 rpm for 5 m. It results in the formation of a platelet plug and PPP. PPP was then withdrawn to the level of 10mm and discarded. The residual platelet plug, and PPP were reconstituted with a mild manual agitation, which resulted in the formation of 4 mL leukocyte rich PRP.

Injection method

Under strict sterile conditions and ultrasound guidance, a sterile 22-gauge needle was laterally inserted into the mild supraspinatus tear. During the initial injection, 2 mL of leukocytes rich PRP was injected with no concurrent use of local anaesthesia. In the following two durations, just 1mL of PRP was used respectively. Totally, the patient received three PRP injections, each 1 week apart (weeks 0,1, and 2).

Potential adverse effects

No major complications or adverse events were reported during PRP therapy except mild pain at the injection site. It lasted only for ten minutes and relieved by itself [10]. However, the doctor prescribed Co-Codamol (30/500mg) to be taken twice a day in case if the pain persists.

Physical therapy program

The patient continued a physical therapy guided core strengthening program that had begun prior to receiving

PRP therapy for 10 weeks. This program initially included two low graded exercises for three sessions per day. As the patient was able to show satisfactory progress, the program was slowly progressed to eight more difficult exercises for 1 sessions to 2 sessions per day.

Analysis method and outcome measures

Pain and functional outcome were assessed at baseline prior to the first PRP injection and at week 10, using the following validated outcome measures.

1. Oxford Shoulder Score (OSS): It is a questionnaire-based validated scoring system used to assess the degree of pain and disability caused by shoulder pathology, whose score ranges from 0 (severe) to 48 (satisfactory joint function) [13].
2. Visual Analogue Score (VAS): the patient rated his shoulder pain on a scale of 0 (no pain) to 10 (maximal pain) [14].
3. Disabilities of the Arm, Shoulder, and Hand questionnaires (DASH) score: It is a questionnaire-based patient-reported tool that evaluates symptoms and physical disability, whose score ranges from 0 (no difficulty) to 100 (disability) [15].

The structural outcome was also assessed using MRI imaging at baseline and after 18 months.

Outcome and follow-up

Pain and functional outcome

The patient experienced rapid improvement in pain and function following PRP and physical therapy.

The VAS pain score improved from 9 out of 10 to 0 within a week. Both OSS and DASH scores at baseline indicated significant functional impairment (OSS score 14 and DASH score 65). At week 10 after PRP injection, the OSS score reached 48, and the DASH score reached 3.3. Both these scores improved rapidly and indicated no functional impairment until the completion of 10 weeks (Table 1).

At the 10th week following the initial PRP injection, a percentage perceived improvement of 95% was reported by the patient.

Table 1. Score evaluation.

Scores	Pre-PRP	Post-PRP
VAS score	9	0
OSS score	14	48
DASH score	65	3.3

Structural outcome

Repeat MRI performed after 18 m showed no supraspinatus tendinopathy tear with no sign of bursitis. Both acromioclavicular and glenohumeral joints appeared normal.

Complications and adverse events

No significant adverse events were noted throughout the follow-up. The patient reported mild discomfort at the site of injection during PRP administration. This was self-limiting and relieved by itself. The patient did not require analgesics.

Discussion

Rotator cuff tendinopathy is considered a shoulder overuse injury where there is a disruption in the structure of a normal tendon with a failed healing response. Despite the benefits observed in conservative treatment modalities, including the use of physical therapy, medications, and steroid injections, many cases were left unresponsive. Furthermore, there is not enough evidence of structural healing with these conservative treatment modalities.

PRP treatment is comparatively novel and helps to accelerate healing in soft tissue injuries. PRP consists of proteins that alter the patient's pain receptors and lessen pain sensation with its anti-inflammatory effect on injured tendons [16]. Although, PRP has been proven to work in other forms of tendinopathy, very little research has been performed in terms of rotator cuff tendinopathy treatment [17].

A recent systematic review of the use of PRP therapy for rotator cuff tendinopathy concluded that the PRP injection is more efficacious than control injections in patients with shoulder tendinopathy [18]. A drastic improvement in pain score can be observed after the single PRP injection dose [19]. Niazi et al demonstrated that PRP is safe which shows promising results when compared to physical therapy, steroid injections, arthroscopy, and surgeries [20].

In this case report, PRP treatment was administered in conjunction with physical therapy for shoulder tendinopathy treatment, which resulted in rapid clinical improvements in pain and function with no adverse complications.

Although this current study is promising, the use of PRP in rotator cuff tendinopathy is weakly supported due to the lack of standardisation [18]. Hence, further double-blinded randomised controlled trials must be performed on a larger study population to evaluate the efficacy

of PRP-Physical therapy combinational treatment against rotator cuff tendinopathy. Future studies will also standardize the preparation and frequency of PRP injections in this condition.

Learning points

- Rotator cuff tendinopathy is the most common cause of shoulder pain and discomfort.
- Existing conservative and surgical treatment of rotator cuff tendinopathy has reported inconsistent success rates.
- PRP therapy in conjunction with physical therapy shows promise in the treatment of rotator cuff tendinopathy by delivering a rapid clinical improvement in pain and function with no major complications.
- Further controlled trials are required to determine the effect of PRP-Physical therapy combinational treatment on rotator cuff tendinopathy among a

larger population of patients.

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Contributors

Dr Pratham Surya is the treating physician of the patient presented in the case report. Pooja Pithadia was involved in the data acquisition, analysis of data, drafting of the report, have read and approved the final manuscript, agreed to be accountable for the article and ensure that all questions regarding the integrity of the article are investigated and resolved.

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Competing interests

None

Patient consent for publication

Obtained.

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