SHORT COMMUNICATION

Clinical Results of Platelet-Rich Plasma for Partial Thickness Rotator Cuff Tears: A Case Series

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Abstract

Partial thickness rotator cuff tears (PTRCTs) are a common pathology among shoulder disorders in people over 50 years. Treatment of PTRCTs remains controversial. Most studies on the treatment of PTRCTs have explained surgical techniques or outcomes; few studies have centralized on the conservative and new management of PTRCTs, like treatment with Platelet-rich plasma (PRP). These case series study have been conducted on Platelet-rich plasma (PRP) injection, as a concentrated source of autologous platelets in blood plasma, contains several different growth factors and other cytokines that can stimulate healing of soft tissue.
PRP injection showed positive effect on improving PTRCTs complains. This method improved pain, function, DASH score and shoulder joint range motion in. Because of PRP products are safe and easy to prepare and apply, and also according to improving patient's condition, this method can be used to treat PTRCTs.

Keywords: Partial thickness rotator cuff tears, Platelet-rich plasma, PRP injection

Introduction

Partial thickness rotator cuff tear (PTRCTs) is a common pathology among shoulder disorders in people over 50 years old (1, 2). The prevalence of PTRCTs ranges from 13% to 32%, which is in part correlated to patients' age (2-4). In 2002, the mean cost of the physicians' visits and almost 40,000 inpatient procedures on the rotator cuff was 14,000$ per case in the United States (5). Nearly one third of the silent rotator cuff tears will become symptomatic through the following years. In particular, women are more susceptible to be affected by the common shoulder conditions (6, 7). The prevalence of degenerative rotator cuff tears will be increasing as the number of elderly grows in the population. Most studies on PTRCTs have explained surgical techniques or surgical outcomes; however, few studies have disussed the nonoperative modalities including platelet rich plasma (PRP) injection (2, 5, 7-13).

The use of PRP was first describes in 1999 by a research group in Vitoria in Spain for maxillofacial and plastic surgery (14). Recent researches have assessed the biologic enhancement of the healing process. PRP is potentially able to produce collagen, growth factors, and probably increase in the number so available stem cells, which consequently enhance healing by delivering high concentrations of alpha-granules containing biologically active moieties (such as vascular endothelial growth factor and transforming growth factor-β) to the areas of soft tissue damage (13, 15, 16). PRP has been shown to be safe and effective in most other fields including dermatology, dentistry and orthopedic surgery (8, 17, 18). This concentration may be applied either in the clinic as a nonoperative treatment or intraoperative (1, 3, 19-21).

In this study we aimed to assess the efficacy of local injection of autologous PRP on pain and function of the patients with PTRCTs.

Case presentation

Nineteen consecutive patients including 8 men and 11 women were enrolled and treated with an autologous PRP injection for the treatment of PTRCTs. The indication for PRP injection was physical examination and MRI findings consistent with type I, II and III of PTRCTs lasting more than at least 3 months based on the Ellman's classification (grade 1: partial tear < 3mm deep, grade 2: partial tear 3-6 mm deep not exceeding one-half of the tendon thickness, grade 3: partial tear > 6 mm deep) (22). Of these patients, 21% (4 patients) were type

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Table1. Comparison of patiant's outcomes before and after PRP injectins

Variables	Before Injection		After Injection		*P Value*
	Mean	Std. Deviation	Mean	Std. Deviation	
Abd	90.9474	20.45177	139.8421	20.47834	0.000
Flx	97.2632	17.12646	149.1053	16.25455	0.000
VAS	7.5263	0.77233	2.5789	1.21636	0.000
DASH	60.1579	10.01140	34.2632	4.47017	0.000
SF12	31.7368	4.60485	58.5263	7.57805	0.000

I, 58% (11 patients) type II, and 21% (4 patients) were type III. While pain was the most common symptom, commom physical examination findings were painful arc of motion, crepitus, weakness, and positive impingement tests. In addition, some patients were having difficulty with overhead activities.

Patients were excluded if they exhibited any of the following criteria: previous surgery on the affected shoulder, evidence of infection, underlying metabolic or inflammatory disease, referred pain from the neck, bone marrow pathology, abnormal platelet count, use of systemic steroids, current use of anticoagulants (unless withdrawn 7-10 days before injection), and any conditions or situations that might place the patient at significant risk during the study.

Treatment and Experimental protocol

After the initial examination, the treatment protocol of autologous PRP injection was followed by educating the patients to perform shoulder stretching exercises. Two sets of 10 ml of the participant's blood was drawn from the superficial saphenous vein by double syringe (syringe was distributed by Arthrex, Inc. USA). Next, the blood sample was centrifuged at 5000 rpm for five minutes to discrete the blood into layers of red blood cells, buffy-coat of leucocytes, and plasma (Arthrex, Inc.USA) and lastly PRP was separated (19, 23). We injected this product into the subacromial bursa and intra-articular space. After injection, all patients were allowed to move their shoulders and were trained to follow a home exercise program of shoulder stretching exercise. Routine visits were performed at 1 month intervals for 3 months.

Assessment was done before injection and 3 month after. Passive shoulder abduction and flexion was measured by the goniometer. Pain was measured by the visual analogue scale (VAS) with 0 indicating no pain and 10 indicating the worst possible pain). The Persian version of the Disability of the Arm, Shoulder and Hand (DASH) questionnaire and SF-12 Health Survey questionnaire were used to assess the functional status.

Clinical Outcome

The average age of the patients was 56 ± 4.1 years (range, 50-63 years old). Right shoulder was injected in 14 patients and left shoulder was done in the other 5 patients.

The average pre-treatment flexion was 97 degrees and abduction was 91 degrees. Also scores for VAS, DASH, and SF-12 Health Survey questionnaire were 7.5, 34, and 32, respectively [Table 1]. After 3-month follow-up, all patients showed significant improvement in shoulder ROM, pain, and function. Patients reported 53% improvement in shoulder ROM, 66% in pain, 76% in DASH score, and 84% in SF-12 Health Survey questionnaire.

Discussion

The repair of a partially torn rotator cuff tendon may be successfully performed through a variety of techniques such as open or arthroscopic methods. Repaired tissue often degenerates locally and might enhance a weak quality. A partial tear may be completed to a full thickness tear, which is then repaired as a full thickness rotator cuff tear. Moreover, complications of surgery including infection and shoulder stiffness have a relatively high prevalence (1-4, 20, 22). This has lead the surgeons to investigate the effect of intraoperative PRP injection (2, 7, 9, 11, 12, 24). Furthermore, some researches have shown that nonoperative treatment with PRP can be as effective as surgery in patients with PTRCTs.

Biologic augmentation strategies such as PRP offer the potential to improve healing in partial tears or in situations when prior repair has failed (2, 17, 25-27). The healing potential of PRP has been described to the release of multiple growth factors from the highly concentrated platelets. In recent studies, enhanced tendon repair was demonstrated following application of growth factors (5). Platelet derived growth factor (PDGF), epidermal growth factor (EGF), vascular endothelial growth factor, and transforming growth factor beta (TGF-b) are key cytokines existing at high levels in platelet rich plasma (PRP) (8, 28-30)

In this report, we evaluated the efficacy of PRP injection in patients with PTRCTs. After 3 month the result showed improvement in shoulder joint ROM, DASH score, pain and function, without any side effects or complications. Overall, the goal of PRP injection is to accelerate the natural healing cascade through the action of the elevated cytokine concentrations released during platelet degranulation, which probably stimulates the capillary regeneration (31-33).

Additional research with randomized clinical trials is warranted to determine the effect of this protocol and to be able to attribute the improvement to the PRP rather than the stretching exercise and other probable intervening factors (34). Other limitations were small number of

the patients and short follow-up. We did not have a gold standard such as follow-up MRI or arthroscopy to prove the healing. However, we were able to assess the clinical outcomes. Future studies should investigate tendon healing using magnetic resonance imaging (MRI).

PRP injection showed positive effect on improving PTRCTs. This method improved pain, function, DASH score, and shoulder range of motion while it is safe too.

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