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Research Article

OUTCOMES OF PRP INJECTION THERAPY IN SUBACROMIAL SPACE IN PARTIAL TEARS OF ROTATOR CUFF

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ABSTRACT

Objective: The aim of the study was to record therapy in the subacromial area in cases of partial rotator cuff (RC) tears on controlling pain and improving shoulder mobility and performing daily activities with ease.

Methods: The study was conducted in the Orthopedics branch of Government Medical College and Rajindra Hospital Patiala on a total of 50 patients (aged more than 20 years) who presented in the emergency and Outpatient Department with symptoms of anterolateral shoulder pain and decreased range of motion at shoulder joint, who had not responded to conservative management and physiotherapy measures for consecutive 3 months. The patients were subjected to magnetic resonance imaging of the affected shoulder and those who showed partial cuff tears were considered for the study. Every consenting patient was given a PRP injection by posterior approach into the subacromial space. Patients were then followed up subsequently after 1 month, 6 months, 12 months, and 24 months for resolution of symptoms and improved painless activities at the shoulder. The outcome was assessed based on Visual Analog Scale (VAS) system and constant shoulder scoring system.

Results: Comparison of the patients before and after injection therapy revealed a significant difference in VAS and constant shoulder scale at all the follow-up times with maximum improvement at the longest follow-up period.

Conclusion: Injection of PRP in subacromial space was found safe and effective in enhancing overall life quality with the betterment of symptoms in patients with anterolateral shoulder pain, and thus, improving efficiency of work, shoulder functioning in patients having partial RC tears irrespective of its cause with its beneficial effects more at long term.

Keywords: Rotator cuff, Platelet rich plasma, Shoulder joint, Subacromial space.

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INTRODUCTION

The rotator cuff (RC) is a musculotendinous structure constituted by a bunch of muscles along with their tendons that stabilize the shoulder complex, allowing for its enhanced range of motion. Four of scapulohumeral muscles build up the RC, namely supraspinatus, infraspinatus, teres minor, and subscapularis muscle.

Understanding and managing tears of the RC is still evolving. Various pathologies of the RC of current understanding include tensile overload, compression, internal impingement, and acute trauma. Conservative measures of managing RC tears include obtaining pain relief, improving joint motion, and enhancing proprioception. However, surgical treatment remained the mainstay of managing RC tears, which started from open repair to mini open repairs and now inclining toward arthroscopic repairs. Augmentation techniques are also used additionally in large and massive tears. However, in present times, biological substances provide an excellent alternative to surgical interventions by minimally invasive techniques.

Platelet-rich plasma (PRP) is a formulation of amalgamated autogenous platelet gel containing numerous growth factors and bioactive chemicals necessary for musculoskeletal healing [1]. During degranulation, platelets release various cytokines and growth factors, platelet-derived growth factors, epidermal growth factors (EGF), TGF-β, insulin-like growth factors (IGF1), and other growth factors which enhance neo-angiogenesis. It promotes tissue healing by enhancing nourishing factors to the worn and torn cuff tissue and remodeling the cuff [2]. PRP has been regarded as a rich source of bioactive ingredients of autologous origin that can enhance the healing process in the worn and torn sites of tendons. Clinical studies on animal models have concluded a probable role of PRP in managing tears of the RC and other pathologies of tendons around the shoulder.

Full-thickness tears of the rotator cuff are basically managed by surgical interventions and are linked with favorable outcomes postsurgical repair [3]. There is no consensus regarding the treatment of partial RC tears, which fail to respond to conservative methods of treatment along with rehabilitation therapy [4]. Various methods of surgical treatment performed can be pure surgical debridement or in combination with acromioplasty. However, attempts to repair a portion of a partially torn RC tendon at its footprint is highly demanding and if a partial tear gets converted to a complete tear, that poses a concern for the treating doctor. Re-surgical interventions are required in cases where debridement alone is performed, especially in small partial tears [5,6]. Repairing the partially torn tendon to its native site is not feasible by any technique due to the smaller area available beneath the intact tendon and can therefore cause injury to the surrounding normal tendon of the RC. The outcomes of this methodology are not persistently better [7]. Intentional converting to a full tear requires actively trimming and injuring the remaining intact cuff and can lead to stiffness of the shoulder joint with a high re-tear rates of the repaired tendon [8,9]. In cases, where corticosteroid injections are used, short-term pain relief occurs, but it has been associated with tendon ruptures and degeneration in the long term [10-12]. However, PRP has been showing enhanced and improved

tissue healing of the patellar tendon as well [13]. Within the shoulder complex, PRP has been postulated for use in treating RC tendinopathies as well as partial tears of RC in most studies [14-22] and has been beneficial in the resolution of symptoms better than corticosteroids [20,21,23], physical rehabilitation therapy [15], hyaluronic acid injections in subacromial space [14], prolotherapy [19,20], and placebo controls [14,17]. The majority of studies done on these interventions, have followed up the patients upto 6 months and a few extended their follow-ups till 12-month period and none after 12 months time [14,15,17,22]. We began to add a PRP injection into the subacromial space from a posterior soft spot approach, basically through the posterior shoulder arthroscopic portal area, after palpating the soft spot and directing the injection toward the ipsilateral coracoid process. Injection of PRP in this subacromial area soaks the supraspinatus and infraspinatus tendon from the humeral head proximally toward the glenoid rim. It was noticed that an imminent beneficiary outcome with improvement in shoulder functioning was seen in clinical results, then we used this injection therapy as our standard of treatment in patients with RC tears. The sole aim of this study is to assess the effectivity and clinical profile along with side effects of this PRP injection therapy in managing patients with partial tears of the RC who did not respond to medical management and physical therapy for 3 months. An added advantage of this study was to see if patients had any ill effects and idiosyncratic reactions and also to assess whether patients treated by this injection would exhibit any signs or symptoms depicting complete rupture of the cuff which initially were partial tears.

METHODS

The study was conducted in the department of orthopedics in GMC, Patiala, on a total of 50 patients (more than 18 years of age) who came in emergency and outpatient department with non-relieving symptoms of shoulder morbidity by conservative methods for 3 months. With clinical evaluation depicting at least two positive tests for RC pathology were subjected to screening by magnetic resonance imaging (MRI) scanning of the affected shoulder. Those patients who showed features of partial tears of the RC as per findings of MRI were then allocated to study by PRP injection therapy after their consents. Patients were followed up subsequently after 1 month, 6 months, 12 months, and 24 months for relief of their symptoms and improved painless daily activities of the shoulder. The outcome was assessed by the criterion of Visual Analog Scale (VAS) scale and constant shoulder scoring system and compared to preinjection scoring at intervals. VAS is based on the degree of discomfort and pain level where zero represents minimal or no pain and ten signifies the most severe or unbearable pain. The Constant Shoulder Scale (CSS) varies from 0 to 100 and includes a 35 score for subjective assessment and a 65 score for objective assessment. 0-value is painless daily functioning and performing activities with maximum ease and 100 represents the severe difficulty and disability to perform daily routine activities.

Inclusion and exclusion criteria

The inclusion criteria were as follows:

(i) Patients with partial thickness tears of the RC, (ii) diagnosed cases as per MRI findings, (iii) patients consenting for PRP injection therapy, (iv) no other injection therapy to shoulder in the past 3 months like corticosteroids, and (v) patients who are non-responsive to conservative therapy for a minimum of 3 months.

The exclusion criteria were as follows:

(i) Any surgical intervention of the shoulder or any other treatment received within the past 3 months, (ii) clinical profile and pathologies unrelated to RC, (iii) patients with full-thickness tears or massive worn out tissue of RC, (iv) patients on chemotherapy in past 1 year, (v) patients with platelet count <1 lac/dL, and (vi) patients with active sepsis or history of shoulder with septicemic foci.

The brief preparation procedure of PRP formulation is as described: 30 mL of whole blood is withdrawn from the patient peripheral venous channel with an 18-gauge syringe and collected in citrate anticoagulant vial under all aseptic precautions. The anti-coagulated blood is taken to special tubes of the centrifugator machine, which are then placed in the centrifugation machine for a soft spin of 1500 rpm for 30 min from which supernatant is collected and which is subjected to a hard spin of 2200 rpm for 15 min and the ultimate platelet concentrate along with lower one-third of plasma is mixed and is then collected and filled into the sterile syringe for the injection therapy.

Procedural details: After the consent of the patient, the whole of the shoulder joint is exposed. The bony landmarks are marked and the posterior end of the acromian border is palpated. Around 1 cm below, it is a soft spot where the injections were given percutaneously directing the needle toward the ipsilateral coracoid process of the scapula. Under all aseptic precautions after painting and draping the shoulder, the sterile needle is introduced into the space and the PRP formulated is targeted into the subacromial space for the injection instillation. Postinjection, the joint is mobilized through circumduction to let the PRP flow into the space evenly for a minute or two.

RESULTS

No evident adverse reaction was seen in any of the 50 patients taken into the study. The age of patients taken into our study ranged from 31 to 64 years with no outlier. The arithmetic mean of VAS scores improved from a preinjection value of 8.2–6.2 at 1 month, to 5.2 at 6 months, to 3.4 at 12 months, and to ultimately lowest 1.8 at 24-month postinjection of PRP formulate. The pattern of changes in scores is shown in Tables 1 and 2. There was a statistically significant difference at each follow-up of the patient from the preinjection mean VAS value with only one patient having a VAS value hike at 1-month follow-up by 3 numbers, which however improved significantly at subsequent follow-ups at 6, 12, and 24 months. Although the progression to better scores occurred slowly after 1 month of postinjection, progression to betterment was the sequence of events. All subjects showed favorable results with the betterment of symptoms and improvement in performing daily activities at each follow-up. One patient in our study got operated on after 4 months of injection and this was removed from the study group and another patient lost follow-up due to migration to another country. So thus, all the results were framed and results were calculated on the remaining 48 patients.

CSS similarly showed favorable outcomes at all follow-ups post-PRP injection therapy into the affected shoulder. Mean CSS at the initiation of the study was 82.6 which improved to 62.2 at 1 month, 53.6 at 6 months, 41.8 at 12 months, and 24.4 at 24 months of follow-up after injection therapy shown in Tables 1 and 3.

No patient in the study had deterioration of the shoulder functioning and performing daily activities from the initiation of the study. An

Table 1: Mean Visual Analog Scale and mean constant shoulder scale scores pre and postplatelet-rich plasma injection therapy in the patients

Mean of the scoring systems	Preinjection	Postinjection therapy			
		1 month	6 months	12 months	24 months
Mean VAS	8.2	6.2	5.2	3.4	1.8
Mean CSS	82.6	62.2	53.6	41.8	24.4

VAS: Visual Analog Scale, CSS: Constant shoulder scale

Table 2: Variation of Visual Analog Scale score with time before and after platelet-rich plasma injection in patients with rotator cuff tears of the shoulder.

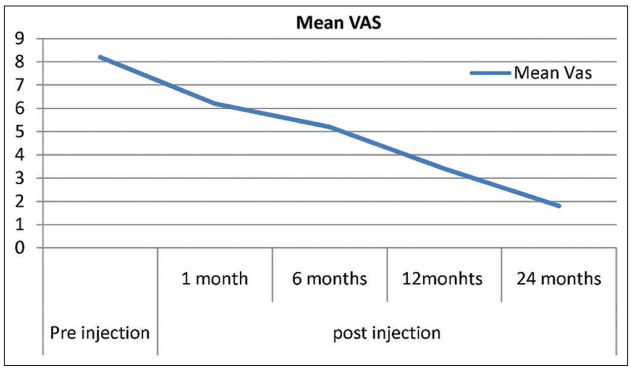
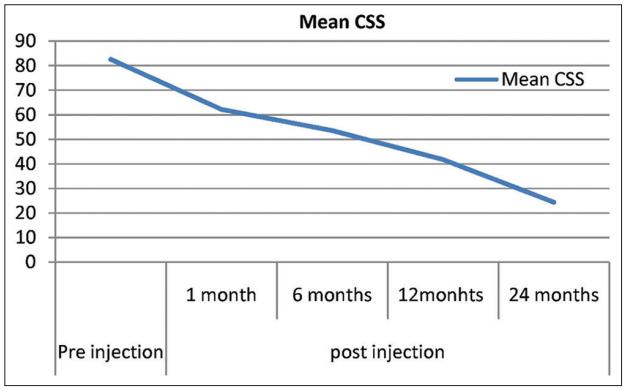


Table 3: The variation of the constant shoulder scale before and after platelet-rich plasma injection in the patients with partial rotator cuff tears of the shoulder.



insignificant difference was noticed between the gender of the patient included in the study. None of the patients who had a partial tear showed symptoms or clinical signs of conversion to full-thickness tear. Individually all the subgroups showed improvement postinjection therapy into the shoulder irrespective of age, gender, and with no evidence of any side effects and poor outcomes at any of the follow-ups of the patient. However, more favorable and comparatively better clinical profiles and satisfaction rates were seen at the longest follow-up of 24 months of the patients.

DISCUSSION

We have various other studies which showed almost the same results with some variable assessment criterion and times of follow-ups. Some are being discussed below in order of year in which study is done.

Sham *et al*., in 2016 [23] performed a randomized controlled trial on a group of patients with painful partial RC tear diagnosed by MRI for PRP and corticosteroid (40 mg triamcinolone) injection into sub-acromial space by landmark guidance of shoulder, as we have used this shoulder bony landmarks for injection technique in the sub-acromial area through soft spot through posterior approach. They took 20 patients in their study with an average age of 52/50 and duration symptoms more than 3 months. This study concluded that PRP is a better formulation than corticosteroids based on VAS, constant scores, and ASES scoring at 6, 12, and 24-month follow-ups. In our study, we followed up with the patients at the same intervals with one additional follow-up at 1 month for any acute flare-ups or immediate postinjection episodic occurrence. Similarly, our study also predicted the favorable outcomes with PRP injection in the long term. Better tendon healing and overall shoulder functional activities improved significantly.

De Sanctis *et al*. [4], in 2021, performed a systematic review on the effectiveness of injection for partial RC tears. They concluded their study by saying that none of the prevailing techniques is indisputably superior to any other. However, treating the partial tears of the RC with PRP injection seems to have superior results and was better on the basis of pain relief and enhancing shoulder mobility. However, in short-term follow-ups, PRP was better only on the basis of the functioning of the shoulder but not in pain control. However, our study depicted the acute pain relief to the patients as well at 1 month of follow-up time and in subsequent time.

Zhv *et al*. [24], in 2022, did a similar study and concluded that PRP showed a far better improvement in the shoulder in terms of functioning and relief from pain irrespective of their subgroups findings where comparison was done with placebo therapy; PRP injection showed more favorable outcomes on overall shoulder improving functional motion and relieving pain at follow-up periods of 8–12 weeks and more than 24-week time of therapy. We followed up with our patients at four intervals postinjection. It is more realistic of the sequential effects of PRP with time over the total improvement in the shoulder functioning.

Hence, our study represents a more of realistic ideology for PRP injection therapy in cases of partial thickness cuff tears. Thus, it has beneficial results in improving the assessment scoring with a resolution of symptoms and improved activity at all the follow-ups of the patients included in our study.

CONCLUSION

PRP is thus an advancing and new modality of choice for tendon healing and regaining vitality of the partially torn RC. Moreover, an effective modality for anterolateral shoulders pain with normal bony congruity with the affection of the RC. The use of PRP injection therapy helps one to evade surgical intervention and produces beneficiary effects for up to 2 years or even longer after the PRP injection. It prevents deterioration of the tendon condition which indicates conversion to complete tear from partial thickness tears of the RC. In surgically unfit patients or in whom the surgery is contraindicated due to some other reasons, PRP has been shown as a palliative treatment tool for improving overall shoulder morbidity. We now state that PRP injection is thus regarded as the primary tool of treatment for patients with partial tears or other inflammatory or degenerative pathologies of the RC who got no betterment with physical therapy and activity modification therapy for consecutive 3 months. Beneficial effects of PRP are seen at all follow-ups but more speedy relief was seen at 1-month postinjection and then slow resolution but gradual and consistent betterment was seen. Furthermore, PRP is a cheap, autogenous, cost-effective, and effective long-term therapy without any hypersensitivity reactions or side effects. Hence, it is preferable to use PRP formulate in partial RC tears to evade surgical intervention and improve the overall painless functioning of the shoulder with minimal intervention as an outdoor procedure.

AUTHORS' CONTRIBUTION

Dr. Harmanpreet Singh – I played an active role to be an integral part of initiating, conducting, and concluding the study through the active participation of my co-authors and coordination of all subjects taken so far in this study. Dr. Sahil Verma, Dr. Kshitij Mehta, and Dr. Dharminder supported and helped me to carry on with my study and to follow-up on my study subjects. Dr. Girish Sahni and Dr. Daljinder played a role as a mentor and helped in carrying out this study more efficiently. Dr. Simran helped me in PRP preparation procedures and counseling patients for the allocation to the study and be convinced for the betterment.

CONFLICTS OF INTERESTS

None.

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No.

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