EuropeanJournalofMolecular &ClinicalMedicine

ISSN2515-8260 Volume 09,Issue 06,2022

Original Research Article

The role of platelet rich plasma in patients with rotator cuff tendinopathy

[1]Dr. Sunil Kumar P,[2]Dr. E Venkateshulu,[3]Dr. Kartik K,[4]Dr. Mohammed AquibShakeel

[1,3]Post Graduate, Department of Orthopaedics, VIMS, Ballari, Karnataka, India
[2]Professor, Department of Orthopaedics, VIMS, Ballari, Karnataka, India
[4]Senior Resident, Department of Orthopaedics VIMS, Ballari, Karnataka, India

Corresponding Author:
Dr. Mohammed AquibShakeel

Abstract

Introduction: Shoulder pain is the most common complaints in medicine and disorders attributed to the rotator cuff are the most common cause of shoulder pain. More than 50% of all shoulder pains are considered to be that related to tendinopathies of the rotator cuff, as supraspinatus in complete thickness tears and tendinosis1. Platelet rich plasma (PRP) is a preparation of concentrated autologous platelets containing growth factors and bio active substances essential to musculoskeletal healing. It involves minimum risk of immune reactions and transmission of infectious and contagious disease. With this we need assess the efficacy of PRP shoulder.
Aim and Objectives: To determine the outcome of PRP injection in patients with rotator cuff tendinopathy and to find out the complications of PRP injections, if any.
Methods: This study included 50 patients diagnosed with Rotator cuff tendinopathy and were recruited from the outpatient department of orthopaedics, VIMS, Bellary from the period between August 2020 to August 2022.The study included both sexes. All patients were injected intraarticularly with PRP. They were evaluated by visual Analogue scale (VAS) for pain and a shortened version of disabilities of arm, shoulder and hand using DASH score for function.
Results: Descriptive and inferential statistical analysis has been carried out in the present study using Student 't' test (two tailed, dependent & independent) and Fisher test. The improvement in VAS score and DASH scores at 3rd, 6th and 12th week follow up in patients who received PRP injections was statistically more significant compared to scores at the time of admission as inferred by p value of <0.05.
Interpretation & Conclusion: Our study concludes that the efficacy of single injection of platelet rich plasma to relieve the pain of Rotator cuff tendinopathy is effective less-invasive lines of treatment over a short term follow up period. However more studies are required to evaluate the efficacy of PRP over long term with multi centric study & comparison with the current available treatment options.

Keywords: Rotator cuff tendinopathy platelet rich plasma, visual analogue scale, dash score, intraarticular injection

Introduction

Rotator cuff tendinopathy is an inflammation of group of muscles and tendon in that surround the shoulder joint along with inflammation of bursa. Rotator cuff tendinopathy is the major cause of shoulder pain and decreased range of motion effecting more than half of general population by the age of 60 years[2]. It is responsible for 85% of the cases, rotator cuff tendinopathy is the most common cause of shoulder pain and disability. Supraspinatus is the most commonly injured in rotator cuff tendinopathyand most of the time, it is accompanied with another rotator cuff muscle tendinopathy[3]. Patients with rotator cuff tendinopathy have a higher risk of being overweight, old age, repetitive lifting, or overhead activities[4].
Platelet-rich plasma (PRP) offers promise for the treatment of various musculoskeletal conditions, as indicated by basic-science and emerging clinical studies. The biological rationale for the clinical use of PRP includes the local delivery of growth factors, modification of the inflammatory response and positive effects of PRP on cell proliferation and differentiation. From a practical U.S. Food and Drug Administration (FDA) regulatory standpoint, PRP falls into the category of minimally manipulated tissue and, as an autologous blood product, it is easier to utilize clinically without extensive testing in preclinical and clinical trials. The lack of regulatory hurdles prior to clinical implementation has resulted in the recent explosion of PRP use in musculoskeletal medicine. However, the specific characteristics of the optimal PRP formulations for use in treating different musculoskeletal pathologies remain unknown.

Review of literature

Mautner *et al*. in 2012 stated that PRP injections carry almost no risk of acquiring a transmitted blood-borne infection or causing any anaphylactic reaction[5].
IIhanli*et al*. compared between PRP therapy and physiotherapy in the treatment of supraspinatus tendinopathy and concluded that PRP therapy is a well-tolerated therapeutic application that showed encouraging clinical results in patients with chronic tendinopathy[6].
Parada *et al*. suggested that surgery, as a classic option for treating these cases, has risks such as infection and damage to surrounding nerves and blood vessels with up to 6 months of recovery period depending on the severity of the injury. Stiffness, weakness, chronic pain, or incomplete healing after surgery can occur[7].
Scarpone*et al*. in 2013 found improvements in pain, function and radiological scores after single injection of PRP[8].
Sengodan*et al*.in 2017 found significant differences in pre and post injection pain scores after single injection of PRP[9].
Shams *et al*. in 2016 reported a statistically significant improvement in both pain and functional scores in PRP group compared to steroid group. The use of leucocyte reduced PRP in this study may have yielded better results[10].

Methodology source of data

The patients attending the OPD of Orthopaedics Department at Vijayanagara Medical College with complaints of shoulder pain were screened and those diagnosed as rotator cuff tendinopathy were chosen for the study.

Sample size

A total of 50 consecutive cases of both sexes, age above 18 years, with rotator cuff tendinopathy, who attended our Orthopaedics OPD during the period between AUGUST 2020 to AUGUST 2022 and willing to participate in the study & satisfying the inclusion criteria were taken as study subjects.

Sampling method

Convenience sampling method was used for collection of samples. Convenience sampling method is a type of non-probability sampling technique where subjects are selected based on their convenient proximity and accessibility to the researcher. The sample for this study was taken based on data obtained from patient diagnosed with rotator cuff tendinopathy at the Orthopaedic outpatient department. The first 50 cases that fulfilled the inclusion and exclusion criteria were taken up for the study.

Study period

Study design: It is a prospective study.

Inclusion criteria

- Patients willing to give written informed consent.
- Patients of either sex aged between 18 and 60 years.
- Patients diagnosed with rotator cuff tendinopathy by ultrasound.
- Patients with Rotator cuff tendinopathy symptoms for more than 3 months.
- Patient with failed conservative treatment of at least 4 weeks of formal medical and physical therapy.

Exclusion criteria

- Patients with previous shoulder deformity, previous surgery to shoulder.
- Patients with neuropathic symptoms, complex regional pain syndromes.
- Patients with anemia, hemorrhagic disorder, pregnancy, diabetes.
- Patient anticoagulant therapy.
- Steroid injection in past 6 months to injured shoulder.
- Patient of another disease that may cause shoulder pain and dysfunction such as rheumatoid arthritis.

Method of collection of data

- After obtaining institutional ethical committee clearance and written informed consent, patients attending the OPD of Orthopaedics department, satisfying the inclusion/ exclusion criteria, were enrolled in the study. Complete Blood Count, Random blood sugar, renal function test done for all the patients enrolled in the study.
- **Radiological evaluation:** Plain radiograph of antero-posterior and oblique views of the shoulder were taken.
- Clinically patients were assessed for pain, stiffness and physical function.
- The severity of pain was graded according to visual analogue scale (VAS).
- A Shortened version of disabilities of arm, shoulder and hand was assessed by using DASH score for function. All the patients were given injection of PRP into affected shoulder either by posterior approach.

PRP preparation: About 15ml of venous blood drawn under aseptic conditions and 0.5 ml of 3.2% trisodium citrate added as an anticoagulant. The sample will be collected in orthopedics OPD at VIMS Ballari and sent to biochemistry lab for PRP preparation, 1st centrifugation done at 1500rpm for 6min.The upper layer above the buffy coat will be collected and transferred to empty tubes, these tubes will be centrifuged again at 3500rpm for

15min.After this 1/3rd of the upper portion of the volume will be discarded and lower 2/3rd portion will be collected as platelet rich plasma. The final product of 3 ml of PRP will be obtained and it will be injected into Subacromial space on the same day through a posterior approach after local anesthesia with 1% lidocaine. Platelet count assessment will be done initially in the whole blood as well as in PRP in all patients. Mean platelet in PRP should be 5-6 times of that in plasma.

Fig 1: PRP preparation

Interventional procedure

After taking informed and written consent, patients were shifted to O.T. IV line was secured and emergency kit kept ready. Patients were placed in sitting position. Parts painted from mid neck to mid arm. About 3 ml of PRP without any activating agent was injected in affected shoulder through posterior approach by identifying soft spot by palpating tip of acromion and tracing backwards the curve, acromion angle is identified, just below the acromion angle feeling the dip and pointing the needle towards coracoid process introducing needle into shoulder feeling for loss of resistance and sometimes withcarm assistance confirming position with the help of 18-gauge needle. Immediately after injection, movement was done at shoulder joint to facilitate even distribution of PRP at shoulder. Post procedural aseptic dressing done with bandage.

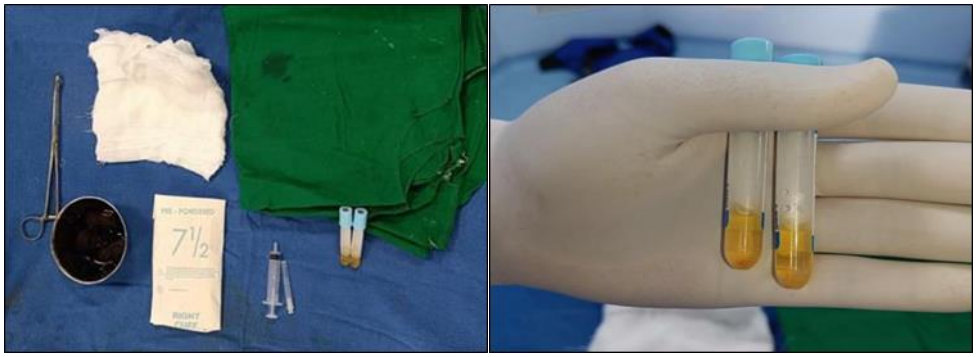

Fig 2: Prepared Platelet rich plasma

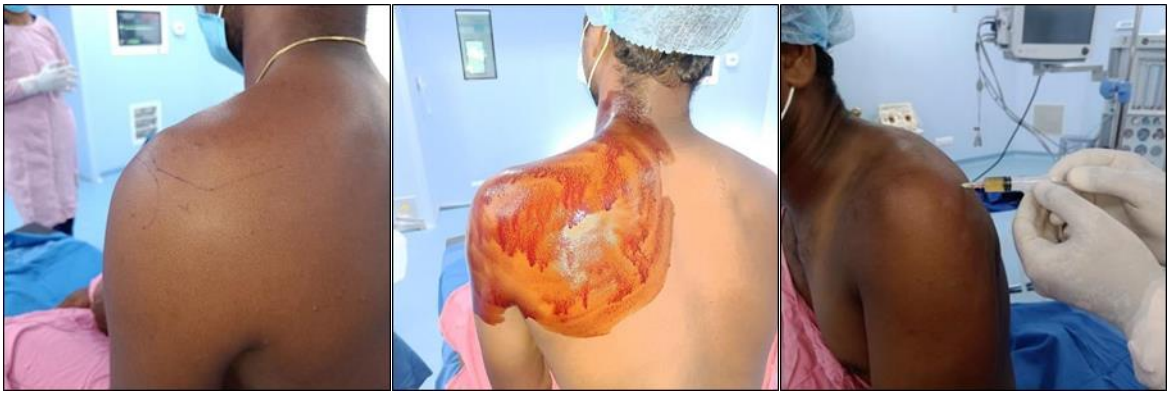

Fig 3: Injecting PRP to the patient

AT Presentation

Fig 4: Shoulder abduction **Fig 5:** Shoulder flexion **Fig 6:** Shoulder internal rotation

AT 12 Weeks

Fig 7: Shoulder abduction **Fig 8:** Shoulder flexion **Fig 9:** Shoulder internal rotation

Observation and Results: (Statistical Analysis)

Table 1: Showing VAS score at presentation at visit, 3rd, 6th & 12th weeks

Vas score	Number of shoulders	Mean	SD	p value
At visit	50	6.2	1.6	0.00001
3rd week	50	4.6	1.0	
6th week	50	3.3	0.9	
12th week	50	2.1	0.7	

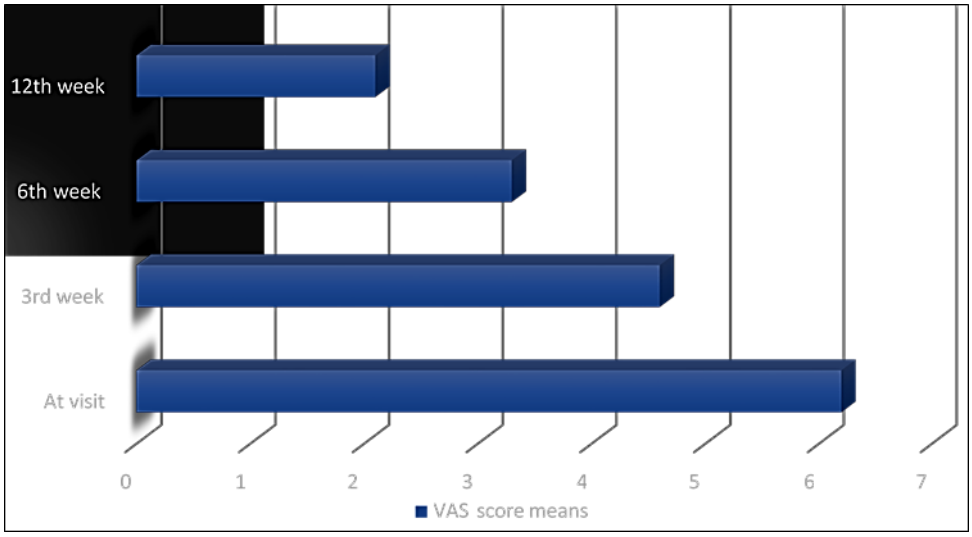

Fig 10: Mean VAS score

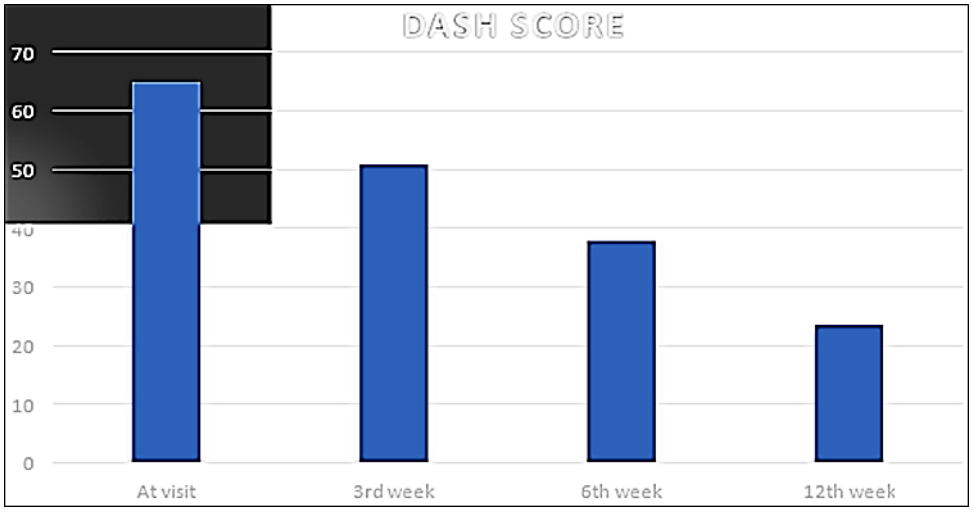

Fig 11: Mean DASH score

Dash score	Number of Shoulder	Mean	SD	p value
At visit	50	64.86	8.10	0.00001
3rd week	50	50.78	9.33	
6th week	50	37.64	7.37	
12th week	50	23.58	5.54	

Discussion

Platelet-rich plasma (PRP) offers promise for the treatment of variousmusculoskeletal conditions, as indicated by basic-science and emerging clinical studies. The biological rationale for the clinical use of PRP includes the local delivery of growth factors, modification of the inflammatory responseand positive effects of PRP on cell proliferation and differentiation. In our study we used wide bore needle (20 gauge) to draw the blood as smaller bore needle can cause unintentional activation of platelets. An anticoagulant which is capable of preserving the platelet functionality, integrity and morphology has to be chosen. EDTA can cause damage to the platelet membrane hence many authors prefer citrate over EDTA as anticoagulant of choice.

Hence, we used 3.2% sodium citrate in our study. In our study there was no time delay during or after drawing blood and it was immediately sent to biochemistry lab for preparation of

PRP. In our study we used double spin technique with 1st spin at 1500 rpm for 6 minutes to separate RBCs from the blood and 2nd spin at 3500 rpm for 15 minutes to concentrate platelets. According to Dugrillon*et al*. number of platelets is not always proportional to the quantity of growth factors more attention has to be given to the quality of platelets over concentration. Higher frequency of rotations may cause mechanical damage to cell wall of platelets and this will decrease the quality of platelets. It may also cause premature activation of platelets. Hence optimal rotations are important. The mean platelet count in PRP in our study was 10.8 lakhs platelets/μL and mean platelet count in blood was 2.1 lakhs/μL. Platelet count in PRP obtained was similar to counts obtained by Perez *et al*. using double spin technique for the action of PRP, platelets need to activated and it can be done using thrombin, calcium chloride or mechanical trauma. Many authors prefer *in vivo* activation without using any external source. In our study we did not use any external source for activation of platelets. All patients received PRP immediately after PRP preparation as delay may decrease the Efficacy of PRP.

Conclusion

The present study was conducted to evaluate the clinical outcome of PRP injection in patients with rotator cuff tendinopathy. Our study showed Autologous PRP is very effective in alleviating pain, reducing joint stiffness and increasing the functional outcome. PRP has an excellent safety profile and is void of the risks attributed to other interventions such as corticosteroids and opioids. Moreover, PRP requires littleto no downtime and may be concurrently administered with physical activity interventions. With further research and understanding, PRP may bridge the “mainstream” gap between conservative and more aggressive surgical interventions and enter the health care reimbursement realm. For those individuals with musculoskeletal injuries that have been recalcitrant to conservative care and have a desire to remain active with exercise or sports, PRP may be a viable option. Intra-articular PRP Injections is safe, simple, cost effective and efficacious in conservative management of rotator cuff tendinopathy.

References

1. Littlewood C, May S, Walters S. Epidemiology of rotator cuff tendinopathy: a systematic review. Should Elb. 2013;5(4):256-65. https://doi.org/10.1111/sa e.12028.
2. Kuiper’s T, Van der Wind DA, Van der Hidden GJ, Twist JW, Ver-GouweY, Bouter LM. A prediction rule for shoulder pain related sick leave: a prospective cohort study. BMC Musculoskeletal Disord. 2006;7:97.
3. Niazi, *et al*. Egyptian Journal of Radiology and Nuclear Medicine. 2020;51:111.doi.org/10.1186/s43055-020-00221-2
4. Via AG, De Cupis M, Spoliti M, Oliva F. Clinical and biological aspects of rotator cuff tears. Muscles, Ligaments and Tendons Journal, 2013, 3(2). https://doi.org/https://doi.org/10.11138/mltj/2013.3.2.070
5. Randelli P, Arrigoni P, Ragone V, Aliprandi A, Cabitza P. Platelet rich plasma in arthroscopic rotator cuff repair: a prospective RCT study, 2-year follow-up. J Shoulder Elb. Surg. 2011;20(4):518-528.
6. IlhanliI, Guder N, Gul M. Platelet-rich plasma treatment with physical therapy in chronic partial supraspinatus tears. Iran Red Crescent Med J. 2015;17(9):e23-732.
7. Parada SA, Dilisio MF, Kennedy CD. Management of complications after rotator cuff surgery. Current reviews in musculoskeletal medicine. 2015;8(1):40-52.
8. Scarpone M, Pritchard M, Rabago D. Effectiveness of platelet-rich plasma Injection for rotator cuff tendinopathy: a prospective Open-label study. Glob Adv Heal Med.

2013;262(22):26-e31.
9. Sengodan VC, Kurian S, Ramasamy R. Treatment of partial rotator cuff tear with ultrasound-guided platelet-rich plasma. J Clin Imaging Sci. 2017;7:32.
10. Say F, Gurler D, Bulbul M. Platelet-rich plasma versus steroid injection for subacromial impingement syndrome. J Orthop Surg. 2016;24(1):62-e66.