European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 09, Issue 02, 2022

Original Research Article

Role of platelet rich plasma in patients with periarthritis shoulder

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Abstract

Introduction: Pain and decreased ROM is a common presenting condition to orthopaedic outpatient department. Primary Frozen shoulder is estimated to affect 3 to 5% of the general population since PRP is an autologous biologic material, it involves a minimum risk of Immune reactions and transmission of infectious and contagious disease. With this we need assess the efficacy of PRP Shoulder.
Aim and Objective: To assess the efficacy of Platelet Rich plasma in periarthritis shoulder.
Methods: This study included 50 patients diagnosed with periarthritis shoulder and were recruited from the outpatient department of orthopaedics, VIMS, Bellary from the period between November 2018 -2020. 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 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. 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 Periarthritis shoulder 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: Platelet rich plasma, visual analogue scale, periarthritis of shoulder, dash score, intraarticular injection

Introduction

The clinical entity which has come to be known as 'periarthritis' of the shoulder is of

particular interest to orthopaedic surgeons because it presents features which are unique. It is unique in that the same pathology does not appear to affect joints other than the shoulder. It is a constant source of amazement that a ' frozen shoulder,' presenting as a virtually complete ankylosis, can spontaneously ' thaw' and leave a completely normal joint.
PAS is believed to have an incidence of 3% to 5% in the general population and up to 20% in those with diabetes [6], patients with PAS have a higher risk of having certain form of pre-diabetic condition with an abnormal fasting glucose or impaired glucose tolerance test [7]. The loss of range is multi planar, with external rotation and abduction being the most affected restricted passive external rotation [8].
Platelet-rich plasma (PRP) offers promise for the treatment of various musculoskeletal conditions, as indicated by basic-science and emerging clinical studies [14-15]. 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 [16].

Review of literature

Duplay MS. [18] In the 19th Century, described stiff and painful shoulders resulting from traumas with subsequent inflammation and fibrous adhesion band formation as ‘scapulohumeral periarthritis’.
Codman [19], in a 1934 series of shoulder periarthritis and bursitis cases coined the term ‘frozen shoulder’ to describe degenerative cuff changes leading to bursal inflammation and adhesions that he hypothesised could re-absorb over time.
Neviaser JS. [20], In 1945 proposed the term ‘adhesive capsulitis’ after surgically releasing capsular adhesions to restore motion in 10 cases of restricted shouldermotion associated with microscopic capsular degeneration.
Havva Talay Çalış *et al*. [54] in 2019 with case series to find the effectiveness of platelet-rich plasma (PRP) on pain, range of motion (ROM), and functionality in patients with frozen shoulder and chronic shoulder pain. The findings reported that Significant improvements were detected in VAS scores on weeks 2, 6 and 12 when compared with baseline ($p<0.05$) and Shoulder Pain and Disability Index scores in all time points when compared with baseline ($p<0.05$). There was a significant improvement in active and passive ROMs on weeks 2, 6, and 12 when compared with baseline ($p<0.05$). Treatment of adhesive capsulitis with PRP may be an alternative treatment method for patients.
Agrawal AC *et al*. [55] in 2019 reported that in single dose PRP on 20 patient resulted in significant improvement in the mean active range of shoulder abduction, flexion, external rotation, and internal rotation in 1-month follow-up. Scores were recorded in Constant and Murley score. It also showed that the pain improvement was 73.3%, activity improvement 75%, arm position improved by 55%, strength of abduction by 68%, and range of motion improved by an average of 75%.

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 periarthritis shoulder were chosen for the study.

Sample size

A total of 50 consecutive cases of both sexes, age above 18 years, with periarthritis shoulder, who attended our Orthopaedics OPD during the period between November 2018 to November 2020 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 periarthritis shoulder at the Orthopaedic outpatient department. The first 50 cases that fulfilled the inclusion and exclusion criteria were taken up for the study.

Study period: November 2018 to November 2020.

Study design: It is a prospective study.

Inclusion criteria

1. Age >18yrs.
2. Patient willing to be included in the study group.
3. Shoulder pain for atleast 1 month.

Exclusion criteria

1. Intrinsic glenohumeral pathology, h/o shoulder trauma/surgery.
2. Patients not willing to be included in study group.
3. Complex regional pain syndrome.

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 were 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) (Annexure).
- 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 anterior or posterior approach.

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PRP Preparation

About 20 ml of venous blood taken from antecubital vein under aseptic precaution and collected in four 5 ml vaccutainers with 0.5 ml of 3.2% trisodium citrate as an anticoagulant at orthopaedic OPD at VIMS Bellary and the sample taken to biochemistry lab for PRP preparation,1st centrifugation done at 750 rpm for 10 min. The upper layer above the buffy coat will be collected and transferred to empty tubes, these tubes will be centrifuged again at 1750 rpm for 10 min. After this 1/3rd of the upper portion of the volume will be discarded and lower 2/3 rd portion will be collected as platelet rich plasma. The final product of 2 ml of PRP will be obtained and it will be injected intra-articularly in affected shoulder on same day. 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 2 ml of PRP without any activating agent was injected in affected shoulder. 1 ml through posterior approach by identifying soft spot by palpating tip of acromion and tracing backwards the curve, acromion angle just below the acromian angle feeling the dip and pointing the needle towards coracoid process introducing needle into shoulder feeling for loss of resistance and sometimes with c arm assistance confirming position.

and injecting 1 ml through anterior approach by palpating humeral head by doing internal and external rotation movement and injecting just medial to head of humerus directly straight facing into the joint with the help of 18 guage needle. Immediately after injection, movement was done at shoulder joint to facilitate even distribution of PRP at shoulder. Local anaesthetics were not used as it could have toxic effects on chondrocytes and could influence activation of platelets by changing pH of the environment. Post procedural aseptic dressing done with bandage.

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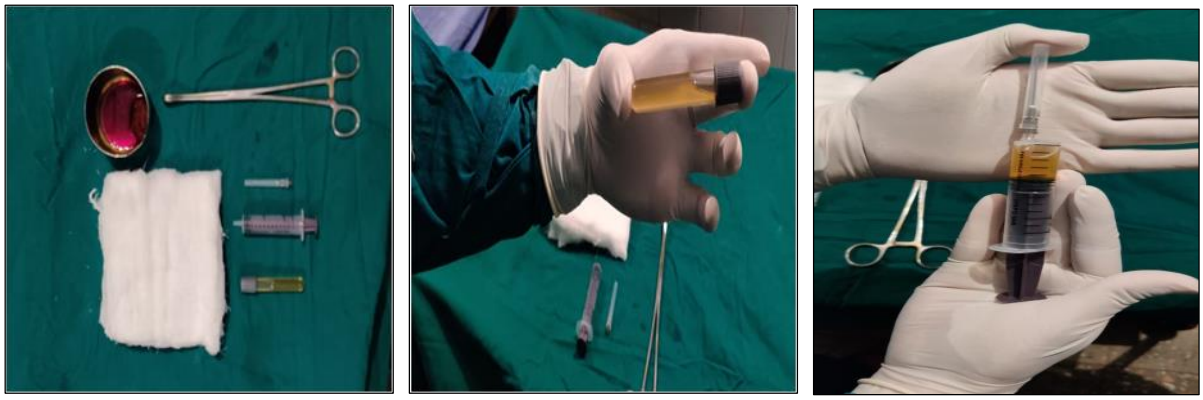

Fig 2: Case 1 (Pre-injection Preparation)

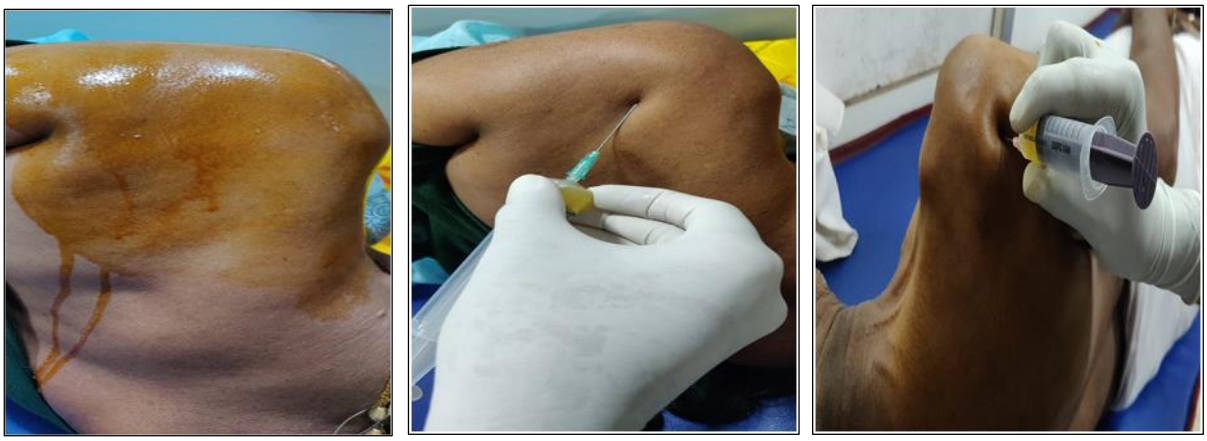

Fig 3: Case 1 (Injecting PRP to patient)

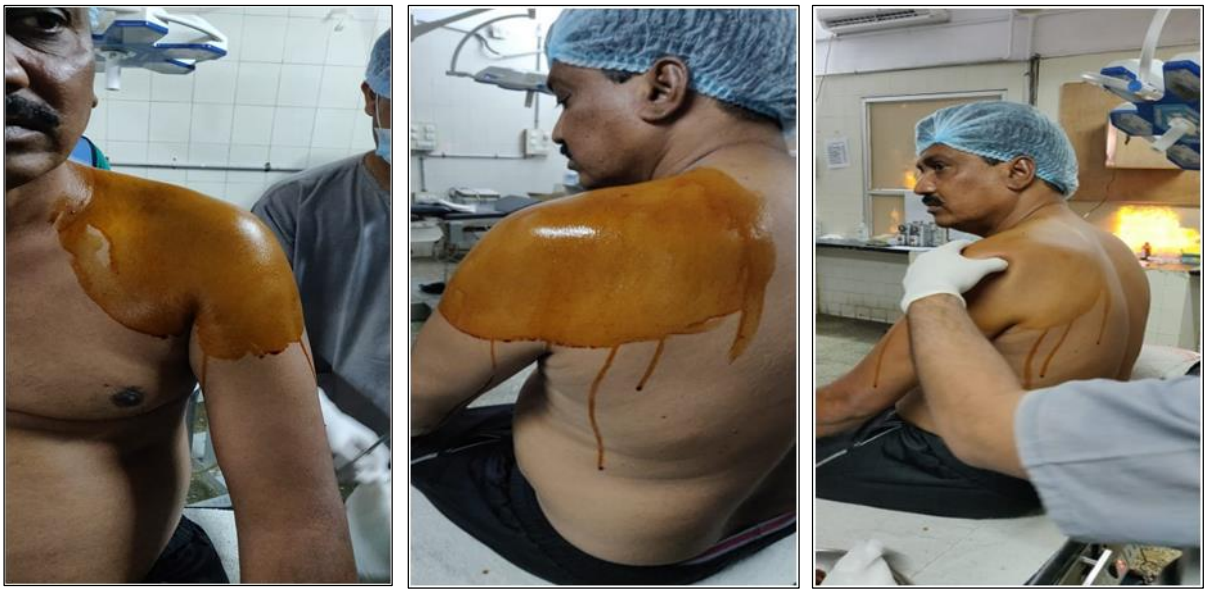

Fig 4: Case II (Preparing & palpating area for inj. PRP)

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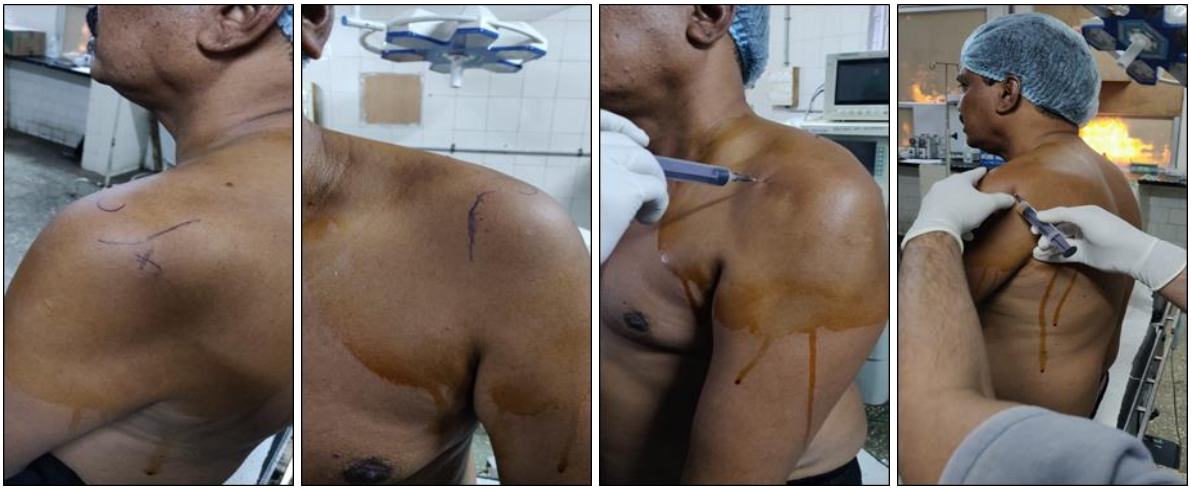

Fig 5: Case II (Marking area & injecting PRP)

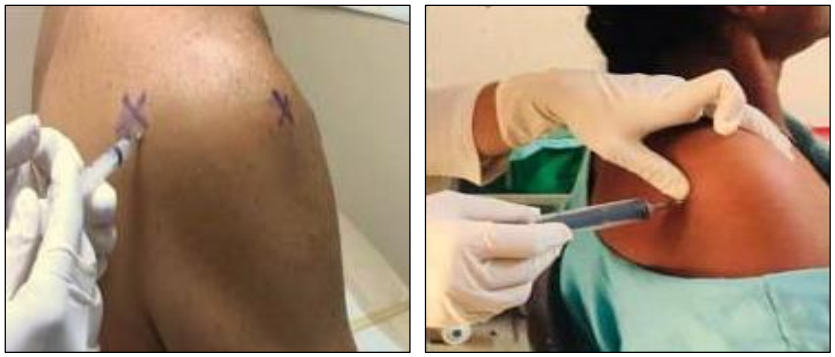

Fig 6: Case III (Marking & injecting PRP)

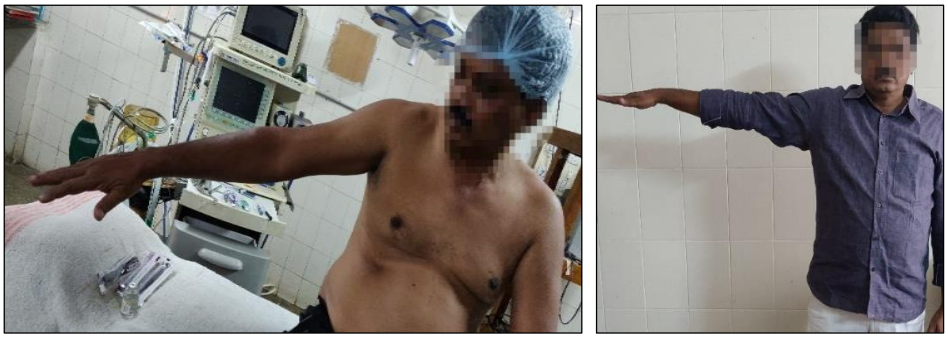

Fig 7: Case I (Shoulder abduction at presentation & at 3 months after inj. PRP)

Fig 8: Case I (Shoulder Flexion at presentation & at 3 months after inj. PRP)

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Fig 9: Case II (Shoulder abduction at presentation & at 3 months after inj. PRP)

Fig 10: Case II (Shoulder flexion at presentation & at 3 months after inj. PRP)

Fig 11: Case II (Shoulder external rotation at presentation & at 3 months after inj. PRP)

Observation and Results: (Statistical Analysis).

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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	6.28	1.61	0.00001 S $p < 0.05$
3rd week	50	4.66	1.02	
6th week	50	3.34	0.92	
12th week	50	2.16	0.77	

(p value calculated using paired t test)

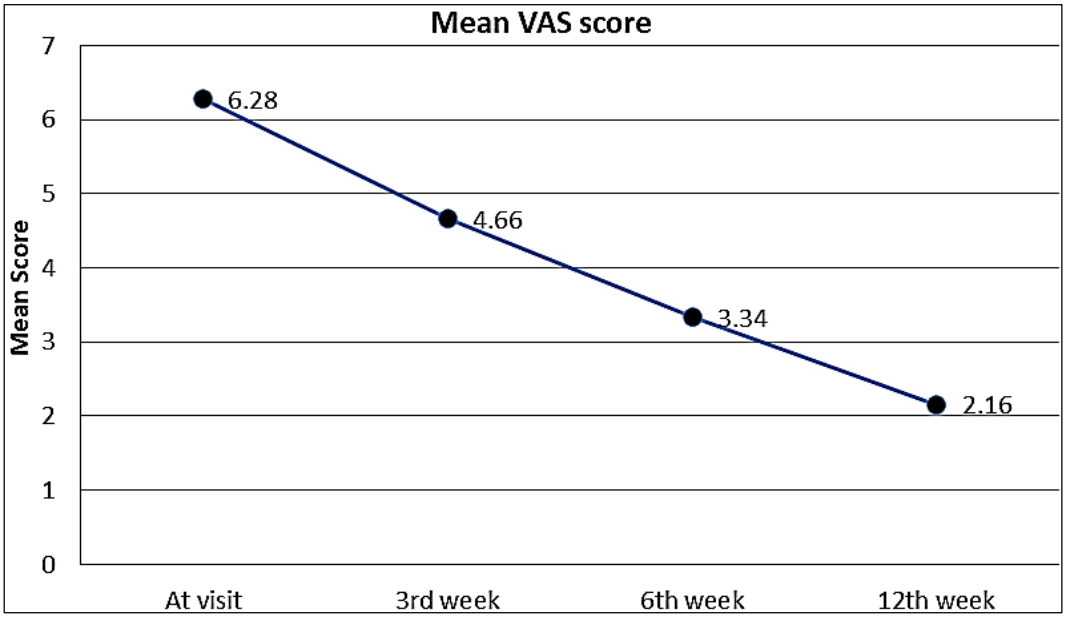

Fig 12

Table 2: Showing DASH score at presentation at visit, 3rd, 6th & 12th weeks

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	

(p value calculated using paired t test)

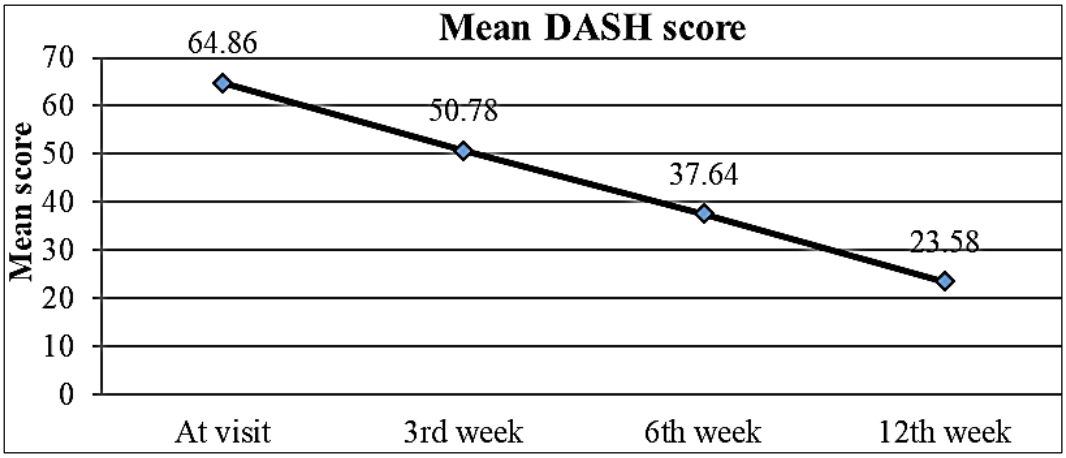

Fig 13

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Table 3: VAS score pre-injection & after 12th weeks of injection

Vas score	Mean ± SD	95 % of CI		p value
		Lower	Upper	
Pre-injection	6.28 ± 1.61	3.847	4.393	0.00001 S p < 0.05
Post Injection at 12 weeks	4.66 ± 1.02			

(p value calculated using paired t test)

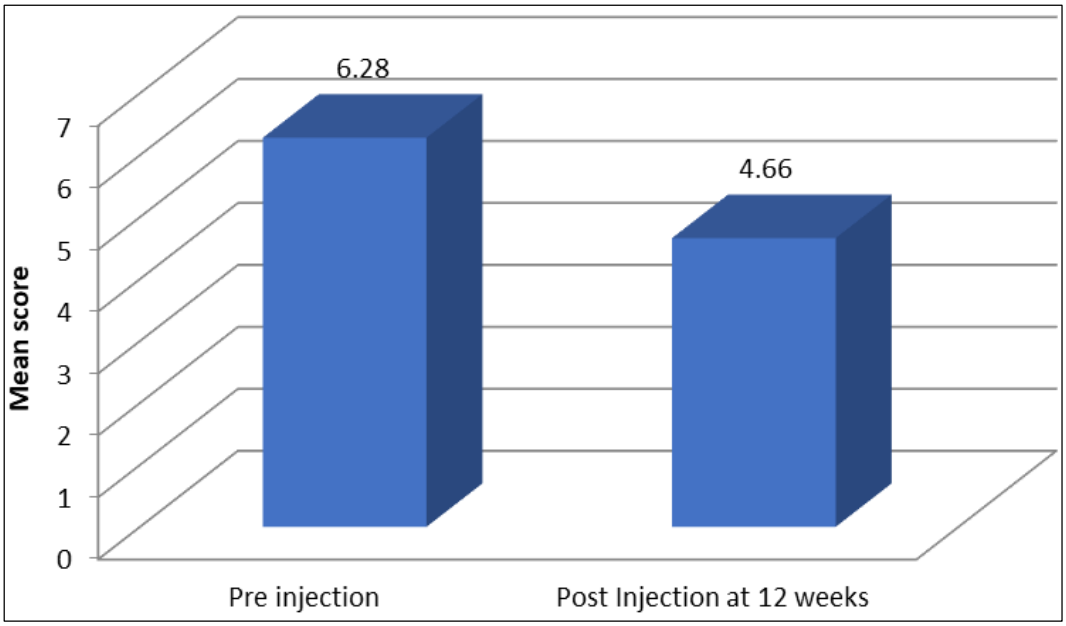

Fig 14: Mean VAS score pre & post injection

Discussion

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 [94].

In our study we used wide bore needle (20 gauge) to draw the blood as smaller bore needle can cause unintentional activation of platelets [95]. 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 [35]. 74 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 750 rpm for 10 minutes to separate RBCs from the blood and 2nd spin at 1750 rpm for 10 minutes to concentrate platelets. According to Dugrillon *et al.* [96] 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.* [97] 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 [95]. 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.
Local anesthetics were not used to prevent pain when injecting as they can compromise therapeutic potential by altering the PH of the joint.
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 intra articular injection of PRP in patients with periarthritis of shoulder.
Our study showed Autologous PRP is very effective in alleviating pain, reducing joint stiffness and increasing the functional outcome in patients with early periarthritis. Young patients with periarthritis with shorter duration of symptoms had excellent 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 little to 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 periarthritis of shoulder.

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Accepted on 28/05/2022