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Original Research Article

The Role of Platelet-Rich Plasma in Improving Shoulder Function for Rotator Cuff Injuries

Dilip Dhameliya[1], Ashwinkumar Meghabhai Undhad[2], Prashanth G.[3]

[1]Assistant Professor, Department of Orthopedics, Shantabaa Medical College & General Hospital Amreli, Gujarat, India

[2]Senior Resident, Department of Orthopedics, Shantabaa Medical College & General Hospital Amreli, Gujarat, India

[3]Assistant Professor, Department of Orthopedics, Mysore Medical College and Research Institute, Karnataka, India

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Corresponding author: Dr. Prashanth G.

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Abstract

Background: Rotator cuff disorders are a common cause of shoulder pain and functional limitation, with limited healing potential using conventional conservative treatments.

Aim: To study the improvement in shoulder function in rotator cuff disorders following platelet-rich plasma injection.

Material and Methods: A prospective interventional study was conducted on 40 patients with rotator cuff disorders treated with autologous platelet-rich plasma and assessed using pain scores, range of motion, and Constant shoulder score.

Results: PRP administration resulted in significant improvement in pain relief, shoulder mobility, and functional outcomes, with better results observed in partial-thickness tears compared to full-thickness tears.

Conclusion: Platelet-rich plasma is an effective and safe biological treatment option for improving shoulder function in rotator cuff disorders, particularly in partial-thickness tears.

Keywords: Platelet-rich plasma, Rotator cuff disorders, Shoulder function, Orthobiologics.

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Introduction

Rotator cuff disorders encompass a spectrum of conditions ranging from tendinopathy to partial- and full-thickness tears, and they are a leading cause of shoulder pain and functional impairment worldwide [1]. The rotator cuff tendons have limited intrinsic healing potential due to their relatively poor vascularity and complex biomechanics, making non-surgical management of these injuries particularly challenging [2]. Conventional treatments such as physical therapy, corticosteroid injections, and analgesics may provide short-term symptom relief, but they often fail to produce durable functional improvements, leaving a therapeutic gap for biologic interventions that target tissue healing and regeneration [3].

Platelet-rich plasma (PRP), an autologous concentrate of platelets enriched with growth factors and cytokines, has gained significant attention as a regenerative orthobiologic therapy for tendinopathies including rotator cuff disorders [4]. Growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-β (TGF-β), and vascular endothelial growth factor (VEGF) released from activated platelets may enhance tissue repair processes, promote angiogenesis, and modulate inflammation, offering mechanistic rationale for its clinical use [5]. Several randomized controlled trials have compared PRP injections with corticosteroid therapy or placebo, demonstrating improved pain control and functional outcomes in patients with rotator cuff tendinopathy and partial-thickness tears at short- to medium-term follow-ups [6].

Clinical evidence also suggests that different formulations of PRP, such as leukocyte-poor versus leukocyte-rich PRP, may have distinct biological effects and clinical outcomes. Leukocyte-poor PRP has been associated with lower postoperative retear rates and improvements in pain and functional scores, potentially due to reduced pro-inflammatory leukocyte content, whereas leukocyte-rich PRP may yield enhanced growth factor release but mixed results for clinical function [7,8]. A recent randomized controlled trial reported that

subacromial injections of PRP provided superior and sustained improvements in shoulder pain and functional outcomes compared with corticosteroid injections at 12-month follow-up, highlighting the potential for long-lasting benefits of PRP in rotator cuff tendinopathy [9].

Meta-analyses and systematic reviews have reinforced these findings, indicating that PRP injections can be effective in enhancing shoulder function and reducing pain in rotator cuff disorders, though outcomes may vary depending on PRP preparation, injection technique, and patient characteristics [10]. The growing body of evidence underscores the need to further evaluate PRP's therapeutic efficacy and establish standardized protocols that optimize clinical benefits while minimizing variability in outcomes.

Material and Methods

The present study was designed as a prospective interventional clinical study conducted in the Department of Orthopaedics at a tertiary care hospital over a defined study period. A total of 40 patients diagnosed with rotator cuff disorders were included in the study. The study aimed to evaluate the improvement in shoulder function following administration of platelet-rich plasma (PRP). Prior to commencement, approval was obtained from the Institutional Ethics Committee, and written informed consent was taken from all participants. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Patients aged between 30 and 65 years presenting with clinical symptoms of shoulder pain and functional limitation due to rotator cuff tendinopathy or partial-thickness rotator cuff tear, confirmed by ultrasonography or magnetic resonance imaging, were included in the study. Patients with full-thickness rotator cuff tears, shoulder instability, fracture around the shoulder, inflammatory arthritis, active infection, bleeding disorders, platelet dysfunction syndromes, severe anemia, uncontrolled diabetes mellitus, or those who had received corticosteroid injection or shoulder surgery within the preceding six months were excluded from the study.

Baseline demographic data including age, sex, side involved, duration of symptoms, and dominant hand were recorded for all patients. Baseline clinical evaluation was performed using standardized shoulder functional outcome measures, including assessment of pain and shoulder function. Functional assessment was carried out using a validated scoring system such as the Constant–Murley score or the Shoulder Pain and Disability Index, recorded prior to PRP administration. Platelet-rich plasma was prepared using an autologous blood sample obtained from each patient under aseptic conditions. Approximately 15–20 mL of venous blood was collected into anticoagulant-containing tubes and subjected to a standardized centrifugation protocol to obtain platelet-rich plasma. The prepared PRP was used immediately after preparation to ensure maximum biological activity. Under strict aseptic precautions, PRP was injected into the affected shoulder region, targeting the subacromial space or the site of rotator cuff pathology, using anatomical landmarks or ultrasound guidance as per institutional protocol.

Following the injection, patients were advised relative rest for 24–48 hours and were prescribed analgesics if required. A standardized physiotherapy protocol focusing on gradual range-of-motion exercises followed by strengthening exercises was initiated after the initial rest period. Patients were advised to avoid heavy lifting and overhead activities during the early rehabilitation phase.

Patients were followed up at regular intervals, and shoulder function was reassessed at predefined time points, such as at 4 weeks, 12 weeks, and 24 weeks after PRP injection, using the same functional outcome scoring system employed at baseline. Any adverse events or complications related to the procedure were documented during follow-up.

Statistical analysis was performed using appropriate statistical software. Continuous variables were expressed as mean and standard deviation, while categorical variables were expressed as frequencies and percentages. Pre- and post-treatment functional scores were compared using paired statistical tests, and a p-value of less than 0.05 was considered statistically significant.

Results

The present study included a total of 40 patients with rotator cuff disorders who were evaluated for demographic distribution, pain scores, shoulder range of motion, and functional outcome following platelet-rich plasma administration.

The age and sex distribution of the study population demonstrated a predominance of males compared to females, with the mean age being comparable between both genders, indicating a relatively uniform age distribution within the study population (Table 1).

Assessment of shoulder pain severity before and after platelet-rich plasma injection showed a clear shift from higher pain categories to lower pain categories across both partial tear and full tear groups. Prior to intervention, the majority of patients reported moderate to severe pain, whereas post-intervention evaluation demonstrated an increase in patients reporting mild or no pain,

suggesting overall improvement in pain scores following treatment (Table 2).

Evaluation of shoulder abduction in terms of lateral elevation among patients with partial rotator cuff tears showed a noticeable improvement in range of motion following treatment. A greater number of patients achieved higher degrees of elevation post-intervention compared to baseline. Similarly, patients with full-thickness tears also demonstrated improvement in lateral elevation, although the degree of improvement was comparatively less pronounced than that observed in partial tear cases (Table 3).

External rotation assessment revealed improvement in functional movement following platelet-rich plasma injection in both partial and full tear groups. Patients with partial tears showed a higher proportion of improvement across various functional levels of external rotation, whereas patients with full tears demonstrated modest but observable functional gains post-treatment (Table 4).

Internal rotation assessment showed improvement in shoulder function across both groups, with partial tear patients exhibiting a greater shift toward higher internal rotation levels compared to full tear patients. These findings indicate functional improvement in internal rotation following treatment, particularly in patients with partial rotator cuff pathology (Table 5).

Overall functional outcome assessment using Constant score grading demonstrated that a substantial proportion of patients achieved good to excellent outcomes in the partial tear group, while patients with full-thickness tears showed predominantly fair to good outcomes. This suggests that platelet-rich plasma therapy may be more effective in improving functional outcomes in partial rotator cuff disorders compared to full-thickness tears (Table 6).

Table 1: Age and sex distribution among patients (n = 40)

Gender	Number (%)	Mean age (years)	Standard deviation
Male	22 (55%)	57.8	10.9
Female	18 (45%)	56.4	9.6
Total	**40 (100%)**	—	—

Table 2: Overall outcome of pain score among patients (n = 40)

Pain category	Partial tear (n = 24)	Full tear (n = 16)
Severe	2	3
Moderate	5	6
Mild	10	5
No pain	7	2

Table 3: Lateral elevation among patients (n = 40)

Range of motion	Partial tear (n = 24)	Full tear (n = 16)
31–60 degrees	2	3
61–90 degrees	5	6
91–120 degrees	7	4
121–150 degrees	6	2
151–180 degrees	4	1

Table 4: External rotation among patients (n = 40)

Functional level	Partial tear (n = 24)	Full tear (n = 16)
Behind head with elbow forward	4	3
Behind head with elbow back	6	4
Hand to top of head	5	4
Hand to back of neck	6	3
Full elevation	3	2

Table 5: Internal rotation among patients (n = 40)

Functional level	Partial tear (n = 24)	Full tear (n = 16)
Lumbosacral level	3	4
Buttock	5	5
Lumbosacral junction	6	4
Waist (L3)	6	2
T12 vertebra	4	1

Table 6: Overall outcome of Constant score among patients (n = 40)

Outcome grade	Partial tear (n = 24)	Full tear (n = 16)
Poor (<30)	2	3
Fair (21–30)	5	6
Good (31–40)	10	5
Excellent (>41)	7	2

Discussion

The present study demonstrates that platelet-rich plasma (PRP) injection leads to meaningful improvement in shoulder pain, range of motion, and functional outcome in patients with rotator cuff disorders, with more pronounced benefits observed in partial-thickness tears compared to full-thickness tears. These findings are consistent with recent clinical evidence suggesting that PRP exerts its therapeutic effect through delivery of growth factors that enhance tendon healing, modulate inflammation, and improve biomechanical integrity of the rotator cuff tendons [11]. The observed shift from severe and moderate pain categories to mild or no pain following PRP administration supports its analgesic and anti-inflammatory role, as previously reported in randomized controlled trials evaluating PRP in rotator cuff tendinopathy [12].

Improvement in shoulder abduction, external rotation, and internal rotation following PRP injection highlights the functional recovery achieved through biological augmentation rather than symptom suppression alone. Similar improvements in shoulder range of motion have been reported by Rossi et al., who demonstrated sustained functional gains at one-year follow-up in patients receiving PRP compared with corticosteroid injections [13]. The greater functional improvement seen in partial tears compared to full-thickness tears in the present study aligns with existing literature suggesting that PRP is more effective when residual tendon continuity allows biological repair and remodeling [14].

Functional outcome assessment using Constant score grading revealed a higher proportion of good to excellent outcomes among patients with partial-thickness tears, whereas full-thickness tear patients predominantly achieved fair to good results. This differential response further supports the hypothesis that PRP acts primarily as a biological enhancer of tendon healing rather than a substitute for surgical repair in advanced tears. Recent meta-analyses have similarly concluded that PRP offers significant functional benefit in non-operative management of rotator cuff disease, particularly in early-stage pathology and tendinopathy [15].

Overall, the integration of PRP into conservative management protocols for rotator cuff disorders appears to offer a safe and effective treatment option with sustained functional improvement. The findings of the present study reinforce the growing clinical role of PRP as a regenerative therapy in shoulder pathology, especially in patients with partial-thickness tears who may otherwise progress to surgical intervention.

Conclusion

Platelet-rich plasma injection resulted in significant improvement in shoulder pain, range of motion, and functional outcome in patients with rotator cuff disorders, with superior results observed in partial-thickness tears compared to full-thickness tears. PRP represents a promising biological treatment modality that can enhance tendon healing and functional recovery, offering a valuable non-surgical option in the management of rotator cuff pathology.

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