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FUNCTIONAL OUTCOME OF PLATELET-RICH PLASMA VERSUS CORTICOSTEROID INJECTION IN PATIENTS WITH PARTIAL-THICKNESS SUPRASPINATUS TENDON TEARS: A PROSPECTIVE COMPARATIVE STUDY.

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Abstract

Background: Partial-thickness tears of the supraspinatus tendon are a common cause of shoulder pain and functional limitation. Conservative management frequently includes corticosteroid injections for short-term symptom relief; however, concerns regarding their limited regenerative potential and possible adverse effects on tendon integrity have led to increasing interest in biological therapies such as platelet-rich plasma (PRP). PRP is believed to promote tendon healing through the release of growth factors that enhance tissue repair. Despite its growing use, evidence comparing the functional and radiological outcomes of PRP and corticosteroid injections in partial-thickness supraspinatus tears remains inconclusive. This study aimed to evaluate and compare the functional and radiological outcomes of partial-thickness supraspinatus tendon tears treated with PRP versus corticosteroid injection. ***Aim:*** To compare the clinical efficacy of platelet-rich plasma (PRP) injection and corticosteroid injection in the management of symptomatic supraspinatus tears by evaluating pain relief, functional outcome, and shoulder-related disability over a six-month follow-up period. ***Materials & Methods:*** This study is a prospective, randomized controlled trial (RCT) conducted at a tertiary hospital over a period of one year, from 1st September 2023 to 31st September 2024. A total of 50 patients presenting with symptomatic partial-thickness supraspinatus tendon tears were enrolled for the study ***Results:*** A total of 50 patients with symptomatic supraspinatus tears were included in the study, with 25 patients each in the PRP and corticosteroid groups. Baseline demographic characteristics and clinical outcome scores were comparable between the two groups ($p > 0.05$). Both treatment modalities resulted in significant improvement in pain and shoulder function during the six-month follow-up. The corticosteroid group demonstrated superior early pain relief at 2 weeks (mean VAS: 3.6 ± 0.9 vs. 4.4 ± 0.8; $p = 0.01$). However, the PRP group showed significantly better outcomes from 6 weeks onwards. At 6 months, the PRP group had significantly lower VAS scores (1.4 ± 0.7 vs. 3.0 ± 1.0; $p < 0.001$), higher Constant–Murley scores (86.4 ± 5.3 vs. 74.8 ± 7.0; $p < 0.001$), and lower DASH scores (14.8 ± 5.2 vs. 28.6 ± 6.8; $p < 0.001$) compared with the corticosteroid group. No major complications were observed in either group. Mild transient post-injection pain occurred in two patients (8%) in the PRP group, while transient facial flushing and temporary hyperglycemia were noted in a few patients receiving corticosteroid injections. Overall, PRP demonstrated superior medium-term clinical outcomes despite slower initial pain relief. ***Conclusion:*** Both platelet-rich plasma (PRP) and corticosteroid injections were effective in reducing pain and improving shoulder function in patients with symptomatic supraspinatus tears. Corticosteroid injection provided superior short-term pain relief during the early post-injection period, whereas PRP demonstrated significantly better medium-term outcomes with sustained pain reduction, improved shoulder function, and lower disability scores at six months. PRP appears to be a safe and effective biological treatment option and may be preferred for patients in whom long-term functional recovery and tendon healing are desired.

Keywords: Platelet-rich plasma; Corticosteroid injection; Partial-thickness supraspinatus tear; Rotator cuff tear; Shoulder pain; VAS score; Constant–Murley Score; DASH score.

INTRODUCTION

Shoulder pain is one of the most common musculoskeletal complaints encountered in orthopaedic practice, accounting for approximately 16–26% of all musculoskeletal consultations. Rotator cuff disorders represent the leading cause of chronic shoulder pain, particularly among middle-aged and elderly individuals, resulting in significant pain, functional limitation, reduced quality of life, and loss of productivity. Among the rotator cuff muscles, the supraspinatus tendon is the most frequently affected because of its unique anatomical location beneath the acromion and its relatively poor vascularity near the tendon insertion, making it susceptible to degeneration and tears.[1,2]

Supraspinatus tears encompass a spectrum ranging from tendinopathy and partial-thickness tears to complete full-thickness tears. The condition is multifactorial, with intrinsic factors such as age-related tendon degeneration, hypovascularity, and metabolic disorders interacting with extrinsic factors including repetitive overhead activities, subacromial impingement, trauma, and occupational stress. Progressive tendon degeneration results in pain, weakness, restricted range of motion, and impairment of activities of daily living. If left untreated, partial tears may enlarge over time and eventually progress to full-thickness rotator cuff tears requiring surgical intervention.[1,2]

Conservative management remains the first-line treatment for most patients with supraspinatus tendinopathy and partial-thickness tears. Standard treatment includes activity modification, analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), physiotherapy focusing on rotator cuff strengthening and scapular stabilization, and subacromial injections. Although many patients respond favourably to conservative treatment, persistent symptoms continue to pose a significant therapeutic challenge.[1,2]

Corticosteroid injections have been widely used for decades because of their potent anti-inflammatory effects and their ability to provide rapid pain relief. Corticosteroids reduce synovial inflammation, inhibit inflammatory cytokines, decrease vascular permeability, and alleviate subacromial bursitis, leading to early improvement in pain and shoulder function. However, several studies have demonstrated that these benefits are often temporary and may diminish within a few months. Furthermore, repeated corticosteroid injections have been associated with collagen degeneration, reduced tendon tensile strength, impaired tendon healing, and a possible increased risk of tendon rupture, limiting their long-term use.[6,7]

Platelet-rich plasma (PRP) has emerged as a promising biological treatment for tendon disorders. PRP is an autologous blood product containing a platelet concentration higher than that of whole blood and serves as a rich source of biologically active growth factors, including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), insulin-like growth factor (IGF), and epidermal growth factor (EGF). These growth factors stimulate fibroblast proliferation, collagen synthesis, angiogenesis, extracellular matrix remodelling, and tissue regeneration, thereby promoting tendon healing rather than merely suppressing inflammation.[9–11]

In recent years, PRP has gained considerable attention as a minimally invasive treatment option for rotator cuff tendinopathy and partial-thickness supraspinatus tears. Several randomized controlled trials and systematic reviews have demonstrated encouraging clinical outcomes with PRP, particularly in terms of long-term pain relief and functional improvement. However, the literature remains heterogeneous because of variations in PRP preparation techniques, platelet concentration, leukocyte content, injection protocols, rehabilitation regimens, and outcome assessment methods. Consequently, consensus regarding the superiority of PRP over corticosteroid injection has not yet been fully established.[1,4,5]

Although corticosteroid injections continue to provide excellent short-term symptom relief, increasing evidence suggests that PRP may offer superior medium- and long-term outcomes by promoting biological healing of the tendon. Comparative studies evaluating these treatment modalities are therefore essential to determine the optimal non-operative management strategy for patients with symptomatic supraspinatus tears.[1,4–7]

The present prospective comparative study was undertaken to evaluate and compare the clinical effectiveness of platelet-rich plasma and corticosteroid injections in patients with symptomatic supraspinatus tears. Pain relief was assessed using the Visual Analog Scale (VAS), functional outcome using the Constant–Murley Score and the Disabilities of the Arm, Shoulder and Hand (DASH) score, and safety was evaluated by documenting procedure-related complications during a follow-up period of six months. It was hypothesized that although corticosteroid injection would provide superior early pain relief, PRP would demonstrate significantly better long-term pain reduction, functional recovery, and improvement in shoulder-related disability.

MATERIALS AND METHODS

This prospective, randomized controlled trial (RCT) was conducted in a tertiary health care centre over a period of one year from 1st September 2023 to 31st September 2024. A total of 50 patients with symptomatic partial-thickness

supraspinatus tendon tears were enrolled in the study after fulfilling the eligibility criteria and Patients were randomly allocated into two treatment groups.

Inclusion Criteria

Patients were eligible for inclusion if they met all of the following criteria:

- Age > 18 years
- Clinical features suggestive of rotator cuff pathology presenting as shoulder pain.
- Partial-thickness tear of the supraspinatus tendon confirmed by magnetic resonance imaging (MRI) or high-resolution ultrasonography.
- Persistent symptoms for at least 6 weeks despite adequate conservative management.
- Baseline pain score of ≥4 on the 10-point Visual Analogue Scale (VAS) or significant functional impairment

Exclusion Criteria

Patients were excluded if they had any of the following:

- Full-thickness rotator cuff tear or a partial-thickness tear involving more than 50% of the tendon thickness on imaging.
- Previous surgery or injury to the affected shoulder.
- Previous injection to the affected shoulder.
- Presence of concomitant shoulder pathology likely to influence clinical or radiological outcomes (e.g., adhesive capsulitis, glenohumeral osteoarthritis, shoulder instability, calcific tendinitis, or significant acromioclavicular joint pathology)

PRP Preparation

A total of 20 mL of autologous venous blood was collected in anticoagulant-containing tubes and processed using a double-spin centrifugation technique. Approximately 4 mL of platelet-rich plasma was obtained and injected into the substance of supraspinatus deep to subacromial-subdeltoid bursa using ultrasound guidance.

Injection Technique

A lignocaine sensitivity test dose was administered prior to the procedure. All injections were performed under strict aseptic precautions using a standardized ultrasound-guided approach. Patients were positioned in the sitting posture with the affected arm in modified crass position. A high-frequency linear ultrasound transducer (6–13 MHz) covered with a sterile probe cover and sterile ultrasound gel was used to identify the subacromial-subdeltoid bursa, supraspinatus tendon, acromion, and humeral head. The skin was prepared with 10% povidone-iodine solution and sterile draping was performed.

Local anaesthesia was achieved by infiltrating 2 mL of 2% lignocaine around the planned needle entry site. Under continuous real-time ultrasound guidance, a 23-gauge spinal needle attached to a 5-mL sterile syringe was introduced using an in-plane lateral-to-medial approach, allowing visualization of the entire needle shaft and tip throughout the procedure. The needle was advanced into the subacromial-subdeltoid bursa, and its position was confirmed by direct sonographic visualization. Gentle aspiration was performed before injection to exclude intravascular placement.

Group A (Platelet-Rich Plasma Group): Patients received approximately 4 mL of autologous platelet-rich plasma. The PRP was injected into the substance of supraspinatus at the site of partial tear, deep to subacromial-subdeltoid bursa, with multiple gentle needle fenestrations performed adjacent to the supraspinatus tendon before injection to facilitate biological healing.

Group B (Corticosteroid Group): Patients received an injection consisting of 40 mg (1 mL) triamcinolone acetonide mixed with 3 mL of 2% lignocaine into the subacromial-subdeltoid bursa.

Post-procedure Protocol

Following the injection, patients in both groups were observed for 30 minutes for immediate adverse events. They were advised to avoid strenuous overhead activities, heavy lifting, and sports involving the affected shoulder for 48 hours. Paracetamol was permitted for post-procedural pain relief, while non-steroidal anti-inflammatory drugs were avoided for two weeks in the PRP group to prevent interference with the biological activity of platelets.

A standardized rehabilitation protocol was initiated in both groups. Pendulum exercises were started within 24–48 hours, followed by gradual progression to passive and active-assisted range-of-motion exercises, rotator cuff strengthening, scapular stabilization exercises, posterior capsular stretching, and proprioceptive training under physiotherapy supervision. Compliance with rehabilitation was encouraged throughout the study period.

Patients were evaluated at baseline and at 2 weeks, 6 weeks, 3 months, and 6 months post-injection. Outcome measures included pain assessed using the Visual Analog Scale (VAS), shoulder function assessed using the Constant–Murley Score and the Disabilities of the Arm, Shoulder and Hand (DASH) score, range of motion measured with a goniometer, and procedure-related complications.

Post-procedure Protocol

Following the injection procedure, all patients were observed for 30 minutes for immediate adverse reactions, including allergic manifestations, vasovagal episodes, excessive pain, or bleeding. Patients were discharged after 2 hours of hospital stay after confirming clinical stability.

Patients in both groups were advised to avoid strenuous shoulder activity, heavy lifting, overhead movements, and contact sports involving the affected limb for the first 48 hours following the injection. Application of ice packs for 10–15 minutes, three to four times daily, was recommended during the first 24 hours if required. Oral paracetamol (650 mg) was permitted as rescue analgesia for post-procedural discomfort.

A standardized physiotherapy protocol was followed for all patients to eliminate rehabilitation-related bias. Pendulum (Codman's) exercises were initiated 24–48 hours after the procedure, followed by passive and active-assisted range-of-motion exercises during the first two weeks as tolerated. From the third week onwards, progressive rotator cuff strengthening, scapular stabilisation exercises, stretching of the posterior capsule, proprioceptive training, and functional rehabilitation were introduced under the supervision of a physiotherapist. Patients were instructed to perform a home exercise programme daily, and compliance with physiotherapy was reinforced at each follow-up visit.

Follow-up Assessment

Clinical evaluation was performed at baseline (pre-injection) and subsequently at 2 weeks, 6 weeks, 3 months, and 6 months following the intervention. At each follow-up visit, pain intensity was assessed using the Visual Analog Scale (VAS), shoulder function was evaluated using the Constant–Murley Score, and upper limb disability was assessed using the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire. Active shoulder range of motion, including forward flexion, abduction, external rotation, and internal rotation, was measured using a standard universal goniometer. Any adverse events or complications, including infection, persistent pain, skin changes, neurovascular injury, allergic reactions, post-injection flare, tendon rupture, or recurrence of symptoms, were documented throughout the study period.

Statistical Analysis

The collected data were entered into Microsoft Excel 2021 and analyzed using Statistical Package for the Social Sciences (SPSS) software version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages.

The normality of continuous data was assessed using the Shapiro–Wilk test. Baseline demographic and clinical characteristics between the two groups were compared using the independent samples Student's t-test for normally distributed continuous variables and the Chi-square test or Fisher's exact test for categorical variables.

Changes in outcome measures, including the Visual Analog Scale (VAS), Constant–Murley Score, and Disabilities of the Arm, Shoulder and Hand (DASH) score, were evaluated at baseline, 2 weeks, 6 weeks, 3 months, and 6 months. Within-group comparisons between baseline and follow-up visits were performed using the paired Student's t-test. Between-group comparisons at each follow-up interval were analyzed using the independent samples Student's t-test.

A two-tailed p-value of <0.05 was considered statistically significant, while a p-value of <0.001 was considered highly statistically significant. The results were presented using appropriate tables and graphs.

No interim analysis was performed, and all enrolled patients completed the six-month follow-up and were included in the final statistical analysis.

RESULTS

A total of 50 patients with symptomatic supraspinatus tears were included in the study, with 25 patients allocated to the PRP group (Group A) and 25 patients to the corticosteroid group (Group B). Baseline demographic characteristics and clinical scores were comparable between the two groups ($p > 0.05$).

Visual Analog Scale (VAS)

At baseline, the mean VAS score was comparable between the PRP group (7.8 ± 0.8) and the corticosteroid group (7.7 ± 0.9) ($p = 0.74$).

At 2 weeks, the corticosteroid group demonstrated greater pain relief than the PRP group (3.6 ± 0.9 vs. 4.4 ± 0.8, p = 0.01). However, from 6 weeks onwards, the PRP group showed significantly lower pain scores. At the final 6-month follow-up, the mean VAS score was 1.4 ± 0.7 in the PRP group compared with 3.0 ± 1.0 in the corticosteroid group (p < 0.001).

Table 1

Follow-up	PRP (Mean ± SD)	Corticosteroid (Mean ± SD)	p-value
Baseline	7.8 ± 0.8	7.7 ± 0.9	0.74
2 Weeks	4.4 ± 0.8	3.6 ± 0.9	0.01
6 Weeks	3.0 ± 0.8	3.4 ± 0.9	0.04
3 Months	2.0 ± 0.7	3.1 ± 0.9	<0.001
6 Months	1.4 ± 0.7	3.0 ± 1.0	<0.001

Constant–Murley Score

There was no statistically significant difference in baseline Constant–Murley scores between the two groups (PRP: 46.2 ± 6.8; Corticosteroid: 45.8 ± 7.1; p = 0.82).

The corticosteroid group showed faster improvement at 2 weeks; however, the PRP group demonstrated superior functional recovery at subsequent follow-up visits. At 6 months, the mean Constant–Murley score was significantly higher in the PRP group (86.4 ± 5.3) compared with the corticosteroid group (74.8 ± 7.0) (p < 0.001).

Table 2

Follow-up	PRP (Mean ± SD)	Corticosteroid (Mean ± SD)	p-value
Baseline	46.2 ± 6.8	45.8 ± 7.1	0.82
2 Weeks	58.4 ± 6.0	61.5 ± 5.8	0.08
6 Weeks	69.8 ± 5.9	65.4 ± 6.3	0.02
3 Months	79.6 ± 5.5	70.2 ± 6.5	<0.001
6 Months	86.4 ± 5.3	74.8 ± 7.0	<0.001

DASH Score

Baseline DASH scores were similar between the PRP group (64.1 ± 7.5) and the corticosteroid group (63.8 ± 7.8) (p = 0.88).

Both groups showed progressive improvement; however, the reduction in disability was significantly greater in the PRP group after 6 weeks. At 6 months, the mean DASH score was 14.8 ± 5.2 in the PRP group compared with 28.6 ± 6.8 in the corticosteroid group (p < 0.001).

Table 3

Follow-up	PRP (Mean ± SD)	Corticosteroid (Mean ± SD)	p-value
Baseline	64.1 ± 7.5	63.8 ± 7.8	0.88
2 Weeks	48.2 ± 6.9	43.6 ± 7.1	0.04
6 Weeks	34.5 ± 6.2	39.8 ± 6.5	0.02
3 Months	22.1 ± 5.8	31.7 ± 6.4	<0.001
6 Months	14.8 ± 5.2	28.6 ± 6.8	<0.001

Complications

No major complications, including infection, neurovascular injury, or allergic reactions, were observed in either group. Two patients (8%) in the PRP group experienced mild post-injection pain lasting 24–48 hours, which resolved with oral paracetamol. Three patients (12%) in the corticosteroid group experienced transient facial flushing, and two patients with diabetes demonstrated temporary elevation of blood glucose levels for 48–72 hours. No patient required surgical intervention during the 6-month follow-up.

DISCUSSION

The present study compared the clinical efficacy of platelet-rich plasma (PRP) and corticosteroid injection in the management of symptomatic supraspinatus tears. Both treatment modalities resulted in significant improvement in pain and shoulder function during the 6-month follow-up period. However, the pattern of recovery differed between the two groups. Corticosteroid injection provided superior short-term pain relief during the early follow-up, whereas PRP demonstrated significantly better pain relief, functional recovery, and reduction in disability at 3 and 6 months, which is in agreement with several recent randomized controlled trials and systematic reviews.[1,4,5]

At baseline, there were no statistically significant differences between the two groups with respect to age, sex distribution, pain intensity, or functional scores, indicating that the study groups were comparable. This minimizes selection bias and allows the observed differences at follow-up to be attributed more confidently to the treatment interventions.

Pain intensity, assessed using the Visual Analog Scale (VAS), improved significantly in both groups. Patients who received corticosteroid injection experienced more rapid pain relief during the initial two weeks, which is consistent with the potent anti-inflammatory effect of corticosteroids. Corticosteroids suppress inflammatory cytokines, reduce synovial inflammation, and decrease subacromial bursitis, thereby producing rapid symptomatic improvement.[6,7] However, this benefit gradually diminished over time. In contrast, the PRP group showed progressive and sustained reduction in pain throughout the follow-up period, resulting in significantly lower VAS scores at 3 and 6 months. Similar observations have been reported by Shams et al., Kwong et al., and Lin et al.[3–5]

Functional recovery, assessed using the Constant–Murley Score, followed a similar trend. Although early improvement was observed in both groups, patients treated with PRP achieved significantly higher functional scores during later follow-up visits. The superior functional outcome associated with PRP may be attributed to the biological activity of platelets. PRP contains a high concentration of growth factors, including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), insulin-like growth factor (IGF), and epidermal growth factor (EGF). These mediators promote angiogenesis, collagen synthesis, fibroblast proliferation, and tendon remodeling, thereby facilitating tendon healing rather than merely suppressing inflammation.[9–11]

The Disabilities of the Arm, Shoulder and Hand (DASH) score also demonstrated greater improvement in the PRP group. Patients receiving PRP experienced greater reduction in disability and better restoration of daily activities by the end of the study. These findings suggest that the biological regenerative effect of PRP contributes to sustained improvement in shoulder function.[10,11]

The findings of the present study are consistent with several published studies evaluating PRP in rotator cuff pathology. Numerous investigators have reported that corticosteroid injections provide rapid but temporary pain relief, whereas PRP offers superior medium- and long-term clinical outcomes by enhancing tendon healing.[1,3–5] The regenerative potential of PRP is believed to improve tendon quality, reduce recurrent symptoms, and delay disease progression, particularly in partial-thickness tears and chronic tendinopathy.[4,5]

The superiority of corticosteroids during the early post-injection period observed in the present study is clinically relevant. Patients with severe pain often seek immediate symptom relief, and corticosteroids remain an effective option in carefully selected cases. Nevertheless, repeated corticosteroid injections have been associated with collagen degeneration, reduced tendon strength, impaired tendon healing, and a potential increase in the risk of tendon rupture.[6,7] Consequently, corticosteroid injections should be used judiciously, particularly in younger patients and those with structural tendon defects.

PRP, in contrast, has an excellent safety profile because it is prepared from the patient's own blood, thereby minimizing the risk of allergic reactions or disease transmission. Although transient post-injection pain may occur due to the inflammatory response induced by platelet activation, this is generally self-limiting and resolves with conservative treatment.[10,11] In the present study, no major complications such as infection, neurovascular injury, or tendon rupture were observed in either treatment group.

The standardized rehabilitation protocol followed by both groups likely contributed to the improvement observed throughout the study. Early mobilization combined with progressive rotator cuff strengthening and scapular stabilization exercises remains an essential component of successful non-operative management.[12] The superior outcomes observed in the PRP group therefore likely reflect the combined effect of biological tendon healing and structured rehabilitation rather than injection therapy alone.

The present study has several limitations. The sample size was relatively small, limiting statistical power and generalizability. The follow-up duration of six months does not permit assessment of long-term tendon integrity or recurrence. Furthermore, imaging follow-up with ultrasound or magnetic resonance imaging (MRI) was not performed to correlate structural tendon healing with clinical improvement.

Despite these limitations, the study provides clinically relevant evidence regarding the comparative effectiveness of PRP and corticosteroid injections for symptomatic supraspinatus tears. The prospective design, standardized injection protocol, uniform rehabilitation program, and use of validated outcome measures strengthen the reliability of the findings.

Overall, the results suggest that corticosteroid injection is effective for rapid short-term pain relief, whereas PRP provides superior medium-term improvement in pain, shoulder function, and disability. PRP may therefore represent a preferable treatment option for patients with symptomatic supraspinatus tears, particularly younger or physically active individuals in whom long-term tendon healing and preservation of tendon integrity are important treatment goals. Future multicenter randomized controlled trials with larger sample sizes, longer follow-up, and imaging assessment of tendon healing are warranted to further establish the role of PRP in the management of rotator cuff disorders.

CONCLUSION

The present study demonstrated that both platelet-rich plasma (PRP) and corticosteroid injections are effective treatment modalities for symptomatic supraspinatus tears, resulting in significant improvement in pain, shoulder function, and disability scores over a six-month follow-up period. Corticosteroid injection provided superior short-term pain relief during the early post-injection period, making it an effective option for rapid symptomatic management.

However, patients treated with PRP showed significantly greater improvement in pain relief, functional outcome, and shoulder-related disability at 3 and 6 months, as evidenced by lower Visual Analog Scale (VAS) scores, higher Constant–Murley scores, and lower Disabilities of the Arm, Shoulder and Hand (DASH) scores. These findings suggest that the biological regenerative properties of PRP contribute to sustained clinical improvement and enhanced tendon healing compared with corticosteroid injection. Both treatment modalities were found to be safe, with no major procedure-related complications observed during the study period. Mild post-injection pain in the PRP group and transient adverse effects following corticosteroid injection were self-limiting and managed conservatively.

Based on the findings of the present study, PRP appears to be a superior treatment option for patients with symptomatic supraspinatus tears who require sustained pain relief and long-term functional recovery. Although corticosteroid injections remain valuable for immediate symptom control, PRP may be preferred in younger, physically active individuals and in patients with partial-thickness tears where preservation of tendon integrity and biological healing are important treatment goals.

Further multicenter randomized controlled trials with larger sample sizes, longer follow-up periods, standardized PRP preparation protocols, and imaging-based assessment of tendon healing are recommended to validate these findings and establish evidence-based treatment guidelines.

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