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A comparative study of platelet-rich plasma versus corticosteroid injections in the management of partial thickness rotator cuff tears

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ABSTRACT

Background: Rotator cuff disease (RCD) affects over 60% of individuals above 80 years. Partial thickness rotator cuff tears (PTRCTs) cause persistent pain and functional limitation. Corticosteroid injections provide short-term relief but risk tendon degeneration. Platelet-rich plasma (PRP), enriched with TGF-β, VEGF, PDGF and EGF, promotes tendon regeneration and may offer durable benefit.
Methods: Prospective comparative study over 20 months (June 2023–February 2025). Forty-four patients (22 per group) with USG/MRI-confirmed PTRCTs were assigned to Group A (corticosteroid: triamcinolone acetonide 40 mg) or Group B (autologous PRP via MyCells System). Outcomes assessed using VAS (pain), ASES score (function) and shoulder goniometry at 4, 8 and 12 weeks. Chi-square test used; $p<0.05$ considered significant
Results: Both groups had moderate pain at 4 weeks. At 8 weeks, 36.4% of PRP patients improved to mild pain; all corticosteroid patients retained moderate pain. At 12 weeks, 100% of PRP patients had mild pain versus 63.6% moderate and 36.4% severe in the corticosteroid group ($p<0.001$). ASES score was 'better' in 100% of PRP patients versus 'good' in corticosteroid patients ($p<0.001$). USG confirmed tendon regeneration in 100% of PRP patients; persistent tear was noted in 100% of corticosteroid patients.
Conclusions: PRP is superior to corticosteroids for PTRCTs, offering better long-term pain relief, functional outcomes and sonographic tendon regeneration. PRP should be considered a preferred regenerative treatment for partial thickness rotator cuff tears.

Keywords: ASES score, Corticosteroids, Partial rotator cuff tear, Platelet-rich plasma, Rotator cuff disease, Visual analogue scale

INTRODUCTION

RCD is among the most prevalent shoulder conditions, affecting more than 60% of individuals over 80 years of age.[1] The term encompasses a spectrum of pathologies including tendinopathy, subacromial bursitis, cuff tear arthropathy and partial or complete tendon tears.[2] PTRCTs are particularly challenging because of their varied clinical presentation including a painful arc of motion, crepitus, weakness and positive impingement signs and their propensity for progression if left untreated.[3] Conservative management remains the cornerstone of initial treatment, incorporating activity modification, oral analgesics, physiotherapy and subacromial corticosteroid (CS) injections.[4,5] Although CS injections provide short-term pain relief, they carry the risk of tendon degeneration, collagen breakdown and reduced intrinsic healing capacity with repeated use.[6] This has fuelled interest in biologic alternatives that address the regenerative dimension of tendon pathology. PRP is an autologous concentrate enriched with growth factors including transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), PDGF and epidermal growth factor (EGF) that are pivotal in the early stages of tissue repair.[7,8] PRP

injections are postulated to accelerate tendon healing by promoting fibroblast migration, proliferation and neovascularisation.[9] Clinical evidence supports the efficacy of PRP in lateral epicondylitis, knee osteoarthritis and early-stage rotator cuff disease.[10,11]

Despite growing clinical adoption, the relative merits of PRP versus CS injections for PTRCTs remain debated. Some systematic reviews report no significant difference in medium- to long-term outcomes, while others demonstrate superior functional recovery and pain relief with PRP at extended follow-up.[7] The present study was therefore designed to compare PRP and CS injections in a prospective, controlled setting with validated outcome measures over a 12 weeks follow-up.

METHODS

Study design and setting

This was a prospective, comparative study conducted over 20 months (June 2023–February 2025) in the Department of Orthopaedics, PES institute of medical sciences and research, Kuppam 517425. Ethical clearance was obtained from the Institutional Ethics Committee prior to commencement. Written informed consent was obtained from all participants. The study was conducted in accordance with the Declaration of Helsinki (revised 2000).

Sample size

Sample size was calculated using the formula $N=2(Z\alpha+Z\beta)^2\sigma^2/d^2$, where $Z\alpha=1.96$ (95% CI), pooled SD (σ)=2.35 and margin of error (d)=1.5, yielding 22 patients per group. Accounting for 10% attrition, 25 per group were enrolled (n=50) 44 patients completed the study (22 per group).

Inclusion criteria

Age≥18 years, persistent unilateral shoulder pain for ≥3 months, restriction of shoulder movements, USG/MRI-confirmed partial thickness rotator cuff tear

Exclusion criteria

Age<18 years, shoulder joint infection or active malignancy, osteoarthritis of the shoulder; nerve-related symptoms, known bleeding disorders or anticoagulant therapy, immunosuppressive therapy.

Intervention protocol

Patients were allocated to two groups under strict aseptic conditions using the posterolateral approach (1–2 cm distal and 1 cm medial to the posterolateral acromial angle, directed anteriorly, medially and slightly superiorly to 3–4 cm depth).

Group A– Corticosteroid

Single subacromial injection of triamcinolone acetonide (Kenacort-A 40 mg/5 ml; BMS).

Group B– PRP

Autologous PRP prepared via MyCells Autologous Platelet Preparation System (ProTech, Kaylight, USA). 10 ml peripheral blood centrifuged at 3500 RPM for 10 min. Upper platelet-poor plasma (~4 ml) discarded; residual PRP (~2–2.5 ml) above gel separator aspirated, filtered and injected subacromially.

Post-injection

Home shoulder exercises prescribed. NSAIDs withheld for 6 months; strenuous activity restricted for 6 weeks. No formal physiotherapy prescribed.

Outcome measures

Visual analogue scale (VAS)–pain intensity (0–10), American shoulder and elbow surgeons (ASES) score–functional assessment, Shoulder active/passive ROM by goniometry (flexion 0–180°; abduction 0–180°; extension 0–60°; external rotation 0–70°).

Clinical provocative tests-supraspinatus (full can, empty can, drop arm), infraspinatus (resisted external rotation, lag at 20° and 90°, Patte's), teres minor (Hornblower's), subscapularis (Gerber's lift-off, belly-press, bear-hug). Ultrasonography of shoulder–post-treatment tendon integrity.

Statistical analysis

Categorical variables expressed as frequencies and percentages. Chi-square (χ^2) test used for association between categorical variables and treatment group. Exact p values reported; $p<0.05$ considered statistically significant.

RESULTS

Demographic profile

A total of 44 patients (22 per group) completed the study. In both groups, the majority were aged 40–50years (59.1% in Group A; 63.6% in Group B). Age distribution was not significantly different ($\chi^2=0.096$; $p=0.75$). Females predominated in the corticosteroid group (54.56%); males in the PRP group (54.56%) ($\chi^2=44.00$; $p<0.001$) (Table 1).

Baseline clinical features

All 44 participants reported shoulder pain at baseline (100%). Severe difficulty in movement predominated in the corticosteroid group (77.27%), while moderate difficulty was more common in the PRP group (77.27%).

Moderate activity limitation was most frequent in Group A (77.27%) versus mild limitation in Group B (45.45%) (Table 2).

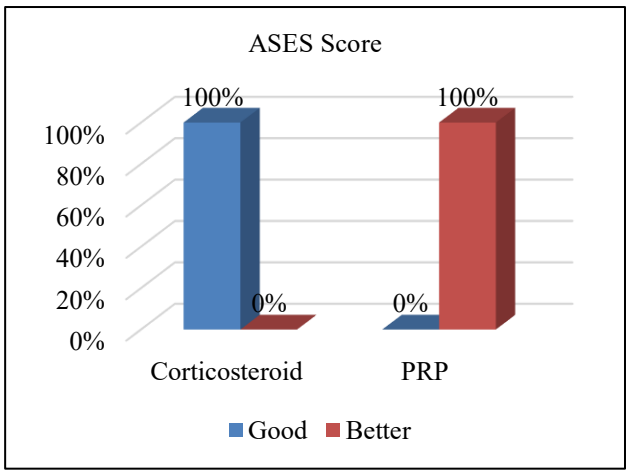

Figure 1: ASES functional score at 12 weeks follow-up (p<0.001).

Comorbidities

Hypertension was more prevalent in the corticosteroid group (59.1% vs. 22.7%; p=0.031). Diabetes mellitus was present in 40.9% of Group A and absent from Group B (p=0.04). Alcohol use was significantly higher in the PRP group (81.8% vs. 0%; p<0.01).

Pain outcome visual analogue scale scores

At 4 weeks, all participants reported moderate pain (100% both groups). At 8 weeks, 100% of corticosteroid patients retained moderate pain, while 36.4% of PRP patients improved to mild pain (p<0.001).

At 12 weeks, the corticosteroid group showed pain progression (63.6% moderate; 36.4% severe), while all PRP patients reported only mild pain (p<0.001) (Table 3).

Functional outcome-American shoulder and elbow surgeon's score

At 12 weeks, ASES score was 'good' in 100% of corticosteroid patients and 'better' in 100% of PRP patients (p<0.001), indicating clinically superior functional recovery with PRP (Figure 1).

Ultrasonographic findings after treatment

Post-treatment USG revealed complete tendon regeneration in all 22 PRP patients (100%), while all 22 corticosteroid patients (100%) had persistent tears with no sonographic evidence of healing (p<0.001) (Table 4).

Table 1: Demographic characteristics of study participants.

Parameter	Corticosteroid (n=22)	PRP (n=22)	P value
Age 40–50 years	13 (59.1%)	14 (63.6%)	0.75
Age 50–60 years	9 (40.9%)	8 (36.4%)	
Male	10 (45.45%)	12 (54.56%)	<0.001
Female	12 (54.56%)	10 (45.45%)	

Table 2: Baseline pain and functional characteristics.

Parameter	Corticosteroid (n=22)	PRP (n=22)	P value
VAS–moderate pain	12 (54.55%)	16 (72.73%)	<0.001
VAS–severe pain	10 (45.45%)	6 (27.27%)	
Moderate difficulty in movement	5 (22.73%)	17 (77.27%)	<0.001
Severe difficulty in movement	17 (77.27%)	5 (22.73%)	
Mild activity limitation	0 (0%)	10 (45.45%)	<0.001
Moderate activity limitation	17 (77.27%)	7 (31.82%)	
Severe activity limitation	5 (22.73%)	5 (22.73%)	

Table 3: Visual analogue scale pain scores at follow-up.

Time point	VAS category	Corticosteroid (n=22)	PRP (n=22)	P value
4 weeks	Moderate pain	22 (100%)	22 (100%)	NS
8 weeks	Mild pain	0 (0%)	8 (36.4%)	<0.001
8 weeks	Moderate pain	22 (100%)	14 (63.6%)	
12 weeks	Mild pain	0 (0%)	22 (100%)	<0.001
12 weeks	Moderate pain	14 (63.6%)	0 (0%)	
12 weeks	Severe pain	8 (36.4%)	0 (0%)	

Table 4: Post-treatment ultrasonographic findings and ASES scores.

Parameter	Corticosteroid (n=22)	PRP (n=22)	P value
Tendon regeneration (USG)	0 (0%)	22 (100%)	<0.001
Persistent tear (USG)	22 (100%)	0 (0%)	
ASES score–Good	22 (100%)	0 (0%)	<0.001
ASES score–Better	0 (0%)	22 (100%)	

DISCUSSION

This study compared PRP and corticosteroid injections in 44 patients with ultrasound-confirmed PTRCTs over 12 weeks. The principal finding is that PRP offers superior long-term pain relief, functional improvement and tendon regeneration, while corticosteroids exhibited transient benefit with progressive pain deterioration.

Demographic comparability

The majority of participants in both groups were in the 40–50-year age bracket (59.1% corticosteroid; 63.6% PRP), consistent with the peak incidence of degenerative rotator cuff disease in middle-aged adults. This is comparable to Shams et al where mean ages were 52±12 (PRP) and 50±10 years (corticosteroid) with no significant intergroup difference.[12] Female predominance in the corticosteroid group and male predominance in the PRP group, while statistically significant, likely reflect referral patterns rather than systematic bias.

Baseline symptomatology

Severe movement difficulty was significantly more prevalent in the corticosteroid group at baseline (77.27%), while the PRP group predominantly exhibited moderate difficulty (77.27%). Baseline comorbidity imbalances (higher hypertension in the corticosteroid group; all PRP patients diabetic) represent a limitation of the non-randomised allocation. Despite these differences, post-treatment gains in the PRP group surpassed those in the corticosteroid group across all outcome domains.

Pain outcomes

The temporal pain trend is clinically instructive: both groups showed equivalent moderate pain at 4 weeks, consistent with the shared latency period of both interventions. By 8 weeks, a divergence emerged PRP patients began improving while corticosteroid patients plateaued. By 12 weeks, the divergence was marked, with corticosteroid patients showing pain progression and PRP patients reporting only mild pain. These findings align with Sari et al who reported significant VAS reductions with PRP at 3, 12 and 24 weeks ($p<0.001$), and with Chen et al, who found PRP significantly reduced long-term retear rates and improved functional outcomes.[13,14] This temporal pattern supports the conclusion that corticosteroids provide anti-inflammatory relief without structural healing, while PRP initiates a durable regenerative cascade.

Functional outcomes

The ASES score was qualitatively superior in PRP-treated patients ('better' vs. 'good' in corticosteroid patients), reflecting meaningful differences in functional capacity and daily activities. This is consistent with Sari et al who found significant ASES improvements in the PRP group at 12 and 24 weeks ($p<0.01$) and with Hurley et al who demonstrated improved Constant, VAS and UCLA scores with PRP.[13,15]

Tendon healing-ultrasonographic evidence

The most compelling finding is complete sonographic tendon regeneration in 100% of PRP patients versus persistent tear in 100% of corticosteroid patients. This provides structural corroboration for PRP's clinical superiority and is consistent with preclinical evidence showing that PRP-derived growth factors (PDGF, VEGF, TGF-β) promote tenocyte proliferation, collagen synthesis and angiogenesis.[8,9] In contrast, corticosteroids are associated with collagen fibre disruption and increased tendon rupture risk with repeated use.[6]

Limitations

Limitations include small sample size (22 per group), single-centre design, 12 weeks follow-up, absence of blinding and baseline comorbidity imbalances. Larger multi-centre randomised controlled trials with ≥12 months follow-up, standardized PRP preparation and platelet concentration quantification are needed to confirm these findings.

CONCLUSION

This prospective comparative study demonstrates that PRP injection is superior to corticosteroid injection for the management of PTRCTs with respect to long-term pain relief, functional outcomes (ASES score) and tendon regeneration confirmed by ultrasonography. Patients treated with PRP showed progressive improvement across all outcomes at 8 and 12 weeks, while corticosteroid-treated patients exhibited initial plateau followed by pain deterioration and persistent tendon tear. PRP should be considered a preferred regenerative treatment modality for

partial thickness rotator cuff tears. Larger randomised controlled trials are warranted to optimize PRP preparation and delivery protocols.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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