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Efficacy Of Platelet Rich Plasma Injection To Treat Rotator Cuff Tendinopathy

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ABSTRACT
Background: *Rotator cuff tendinopathy represents common cause of shoulder discomfort and functional disability. Despite various conservative treatment options, many patients experience persistent symptoms. PRP (Platelet-rich plasma) is recognized as promising biological therapy because of its regenerative properties. This research aimed to evaluate efficacy of PRP injections in improving discomfort and functional results in patients having rotator cuff tendinopathy.*
Methods: *This prospective study included 90 patients (aged 30-60 years) with MRI-confirmed rotator cuff tendinopathy that had not responded to conservative management. Every patient got single ultrasound-guided subacromial injection of 5 mL autologous PRP. Outcomes have been measured at baseline and at 3, 6, and 12 weeks post-injection utilizing VAS (Visual Analog Scale) for pain and SPADI (Shoulder Pain and Disability Index). Range of motion and subjective pain relief have also been assessed.*
Results: *Mean age of participants was 48.2 yrs, with slight female predominance (55%). Mean VAS scores showed significant improvement from 7.67±1.07 at baseline to 1.6±0.74 at 12 weeks ($p<0.001$). Similarly, SPADI scores decreased from 70.65±12.14 to 42.7±12.34 over the same period ($p<0.001$). Subjective pain relief was reported by 82.5% of patients, while 87.5% experienced improved range of motion. No significant adverse events have been observed.*
Conclusion: *PRP injection demonstrated significant therapeutic efficiency in reducing pain and enhancing shoulder function in patients with rotator cuff tendinopathy. Progressive improvement over twelve-week follow-up duration recommends that PRP may offer a safe, minimally invasive treatment option for patients who have not responded to conventional conservative management. More extensive randomised controlled trials with prolonged follow-up durations are essential to further validate these findings.*
Keywords: *Rotator cuff tendinopathy, Shoulder pain, Visual Analog Scale, Shoulder Pain and Disability Index, Platelet-rich plasma*

INTRODUCTION

Shoulder pain represents common musculoskeletal issue, often associated with rotator cuff (RC) conditions, particularly RC tendinopathy [1]. The four muscles that make up RC are infraspinatus, subscapularis, teres minor, and supraspinatus, along with their tendinous attachments, which are crucial for stabilizing and enabling motion at the glenohumeral joint [2]. Tendinopathy of the RC arises from chronic overuse, age-related degeneration, or repetitive micro-injuries, significantly impairing daily functioning and reducing overall quality of life [3]. Epidemiological research suggests the overall prevalence of shoulder disorders is between 7% and 26%, with RC tendinopathy playing a major role in shoulder pain as well as loss of function [4,5].Rotator cuff tendinopathy (RCT) involves a chronic degenerative condition characterized by persistent pain, limitation of shoulder motion, and reduced functional capacity [8]. The underlying causes are multifaceted, typically involving repeated micro-injuries, mechanical stress, and intrinsic degenerative changes within the tendon [9]. Histologically, affected tendons exhibit disrupted collagen architecture, increased cellular proliferation, and enhanced vascularity without significant inflammatory cell infiltration, emphasizing degeneration rather than inflammation as

the primary pathological process [10]. Management encompasses a spectrum of conservative and invasive interventions, including activity modification, anti-inflammatory medications, physiotherapy, and electrotherapeutic modalities [11]. Physiotherapy, particularly exercise therapy, has been well-documented as an effective approach to alleviating pain and restoring function [4,12-14].

Injection therapies have become increasingly utilized for chronic RCT. Although corticosteroid injections are usually employed because of their potent anti-inflammatory effects, concerns about potential tendon weakening and limited long-term benefits have encouraged exploration into alternative biologic therapies [15]. PRP treatment has emerged as notable treatment option because of its regenerative capabilities [16]. PRP is an autologous preparation acquired through centrifuging a patient's blood, concentrating platelets along with multiple essential growth factors [17]. Key bioactive substances found in PRP, including hepatocyte growth factor, transforming growth factor-beta1, platelet-derived growth factor, insulin-like growth factor-1, along with vascular endothelial growth factor, actively facilitate tendon healing, tissue remodeling, and regeneration [18]. Current research objective is to estimate efficiency of PRP injections in enhancing functional results in patients with RCT.

METHODS

This prospective research has been carried out at Department of Orthopaedics, Dr. D.Y. Patil Medical College, between January 2023 and February 2024. Study involved 90 patients aged 30-60 yrs with clinically and radiologically confirmed RCT who had failed conservative management for 3-6 months. Patients with prior steroid injections, shoulder infections, full-thickness tears, instability, or glenohumeral osteoarthritis were excluded.

After obtaining informed consent, baseline assessments were performed using VAS for pain intensity and SPADI for functional evaluation. Under aseptic precautions, 20 mL venous blood has been drawn from each patient and centrifuged to obtain 5 mL PRP having platelet concentration 1,000,000-1,500,000/μL. The PRP has been injected into subacromial space using a posterolateral method without additional activating agents.

Patients have been assessed at 3, 6, and 12 weeks post-injection. At each follow-up, pain intensity (VAS), range of motion, functional status (SPADI), and subjective pain relief were assessed. Statistical analysis has been conducted utilizing SPSS software. Categorical variables have been presented as frequencies as well as percentages, while continuous variables have been denoted as mean ± SD. ANOVA (Analysis of Variance) has been utilized to compare means across time points, with $p<0.05$ being significant statistically.

RESULTS

Demographic and Baseline Characteristics

Result included 90 patients with RCT. Demographic profile revealed a mean age 48.2±9.4 yrs, with majority of patients (50%) in the 50-59 years age group, while 25% each belonged to the 30-39 and 40-49 years age groups. Gender distribution showed a slight female predominance (55%, n=50) compared to males (45%, n=40).

At baseline, most patients reported significant pain, with mean VAS score 7.67±1.07. The SPADI scores at baseline averaged 70.65±12.14, indicating substantial shoulder disability and functional limitation.

Pain Reduction and Functional Improvement

Table 1 shows progressive reduction in VAS scores over follow-up period. Mean pain scores reduced significantly from 7.67±1.07 at baseline to 6.15±1.09 at 3 weeks, 3.57±1.29 at 6 weeks, and 1.6±0.74 at 12 weeks ($p<0.001$ for all comparisons). By the 12th week, 55% of patients reported minimal pain (VAS score of one), while 30% had a score two, and 15% had a score of three.

Similarly, SPADI scores demonstrated significant improvement over time, as shown in Table 2. The mean SPADI score decreased from 70.65±12.14 at baseline to 63.87±12.21 at 3 weeks, 54.2±12.42 at 6 weeks, and 42.7±12.34 at 12 weeks ($p<0.001$ for all comparisons). This represents an overall 39.6% improvement in shoulder function by end of follow-up period.

Patient-Reported Outcomes and Safety

Table 3 summarizes the subjective improvements reported by patients. By the 12th week, 82.5% (n=74) of participants reported noticeable pain relief, while 87.5% (n=79) experienced improved range of motion. Zero significant adverse events or complications have been observed during the trial period.
The distribution of VAS and SPADI scores at the 12th week, as shown in Table 4, indicates that the majority of patients achieved significant clinical improvement. For VAS scores, 55% of patients reported minimal pain (score 1), while for SPADI scores, 75% had scores below 50, representing marked functional improvement.

DISCUSSION

This prospective research showed that PRP injections markedly enhanced discomfort and function in patients with RCT over a 12-week period. The demographic profile revealed a predominance of patients in the 50-59 years age group (50%), consistent with natural history of RC degeneration, which typically manifests during the fourth to sixth decades of life [19,20]. This age-related pattern aligns with the intrinsic mechanism of tendinopathy involving impaired blood supply to RC tendons, leading to cellular degeneration and apoptosis—key factors initiating tendinopathy [21]. While our study showed a slight female predominance (55%), this relatively balanced gender distribution is consistent with findings from previous clinical investigations, such as Rossi et al. (2021) [22], who reported a similar gender profile with 54% female participants.
The significant reduction in pain scores throughout the follow-up period (VAS decreasing from 7.67±1.07 to 1.6±0.74 by week 12, $p<0.001$) demonstrates PRP's effectiveness in alleviating symptoms. These results align with outcomes reported by Rossi et al. (2021) [22], who observed a decline in mean VAS scores from 6.2±1.0 to 2.2±1.1 following PRP treatment at 6-month follow-up. Progressive nature of pain relief suggests that PRP may exert its maximum therapeutic effect over time through biological modulation rather than immediate analgesic action. This timeframe is consistent with Lin et al. (2020) [23], who reported in their meta-analysis that PRP provided significantly greater long-term pain relief (beyond 24 weeks) compared to controls. Concurrent with pain reduction, we observed marked improvement in functional outcomes, with SPADI scores decreasing from 70.65±12.14 to 42.7±12.34 ($p<0.001$). This functional recovery can be attributed to the regenerative properties of PRP, particularly its ability to stimulate tenocyte proliferation, enhance extracellular matrix synthesis, and modulate inflammatory pathways [24-26].
The high rates of subjective pain relief (82.5%) and improved range of motion (87.5%) without adverse events highlight PRP's favorable safety profile and clinical utility. The biological plausibility of these outcomes is supported by experimental studies demonstrating PRP's role in stimulating tendon healing through multiple growth factors [27-29]. Cross et al. (2015) reported that leukocyte-reduced PRP normalized matrix metabolism in torn RC tendons, contributing to restoration of the anabolic-catabolic balance necessary for healing [30]. Unlike corticosteroids, which may cause tendon atrophy with repeated use, PRP offers a safe alternative that potentially addresses the underlying pathology rather than merely masking symptoms. However, methodological limitations in our research comprise absence of control group, comparatively brief follow-up duration, and absence of imaging-based assessment of structural tendon healing. Additionally, variability in PRP preparation remains an ongoing challenge in standardizing clinical applications, as highlighted by Chahla et al. (2017) [31], who advocated for standardized reporting of PRP composition and preparation protocols.

CONCLUSION

This prospective study demonstrates that single ultrasound-guided PRP injection provides substantial enhancement in pain relief and functional results for patients with RCT who have not benefited from conservative management. The progressive reduction in VAS as well as SPADI scores over 12 weeks, coupled with high rates of subjective improvement and absence of adverse events, supports PRP as a safe and efficient therapy option. Regenerative properties of PRP, driven by its concentration of autologous growth factors, appear to facilitate tendon healing and modulate inflammation, contributing to both symptomatic relief and functional restoration.

Given its efficacy, minimal invasiveness, and favorable safety profile, PRP could be regarded as valuable non-operative treatment option for RCT. However, more extensive randomized controlled trials with prolonged follow-up durations, standardized PRP preparation protocols, and imaging-based assessments of structural healing are necessary to further validate these findings and optimize clinical applications.

Conflict of Interest: The authors affirm that there are no conflicts of interest regarding the publication of this case report.

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Author Contributions

SPG conceptualized the study, conducted the investigation, and supplied research materials. KSM was responsible for data collection and organization. USD carried out data analysis and interpretation. ARK prepared both the initial and final versions of the manuscript and managed logistical arrangements. All authors have thoroughly reviewed and approved the final manuscript and take full responsibility for its content and originality.

Use of Artificial Intelligence

AI tools were utilized minimally to assist with grammar correction and formatting. All clinical assessments, scientific insights, and conclusions were exclusively developed and verified by the authors.

Ethical Considerations: This report complies with the ethical standards set forth in the Declaration of Helsinki. Formal institutional ethics committee approval was not necessary due to the nature of a single patient case report.

Patient Consent: Informed written consent was obtained from the patient for the inclusion of clinical details and images. All identifying information has been removed to protect patient privacy.

Legends

1. Intraoperative photo of positioning of needle
2. Intraoperative C-arm shoot

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Table 1: Mean VAS Scores Over the Follow-up Period

Time Point	Mean VAS Score (±SD)	p-value
Baseline	7.67±1.07	-
3 Weeks	6.15±1.09	<0.001
6 Weeks	3.57±1.29	<0.001
12 Weeks	1.60±0.74	<0.001

Table 2: Mean SPADI Scores Over the Follow-up Period

Time Point	Mean SPADI Score (±SD)	p-value
Baseline	70.65±12.14	-
3 Weeks	63.87±12.21	<0.001
6 Weeks	54.20±12.42	<0.001
12 Weeks	42.70±12.34	<0.001

Table 3: Patient-Reported Outcomes at 12 Weeks

Outcome Measure	Positive Response	Percentage
Pain Relief	74	82.5%

Outcome Measure	Positive Response	Percentage
Improved ROM	79	87.5%
No Adverse Events	90	100%

Table 4: Distribution of VAS and SPADI Scores at 12 Weeks

Score Category	VAS Score Distribution	SPADI Score Distribution
1-10	55% (Score 1)	-
11-20	30% (Score 2)	-
21-30	15% (Score 3)	20%
31-40	-	20%
41-50	-	25%
51-60	-	30%
61-70	-	5%