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Original Research Article

# Long-Term Outcomes of PRP Therapy in Subacromial Impingement Syndrome: A Two-Year Prospective Analysis

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**Abstract:**

**Background:** Subacromial impingement syndrome (SIS) remains a common cause of chronic shoulder pain. Platelet-rich plasma (PRP) is increasingly utilized, but high-quality long-term studies, particularly in large cohorts, are lacking. This prospective study evaluates clinical, pain, and functional outcomes after subacromial PRP injections in 40 patients with SIS, followed for two years at PGIMS Rohtak.

**Methods:** Forty adults (mean age 41.2 ± 8.1 years) with clinical and MRI-confirmed SIS, unresponsive to at least three months of conservative therapy, received two subacromial PRP injections four weeks apart. Structured home-based physiotherapy followed. Outcomes were measured using the Visual Analog Scale (VAS) for pain, Constant-Murley Score (CMS), and the University of California Los Angeles (UCLA) score at baseline, 6 weeks, 3 months, 6 months, 1 year, and 2 years.

**Results:** Significant improvements were noted across all outcomes. Mean VAS scores reduced from 7.4 at baseline to 1.5 at two years. CMS improved from 42.6 ± 7.3 to 84.1 ± 6.9, while UCLA scores increased from 15.3 ± 2.8 to 31.2 ± 3.7. Over 85% of patients reported excellent or good outcomes by UCLA criteria at two years. No major complications occurred.

**Conclusions:** Subacromial PRP with rehabilitation confers substantial and durable pain relief and functional improvement in SIS over two years in a real-world clinical population. These findings support the integration of PRP for patients unresponsive to initial conservative management.

**Keywords:** PRP, Subacromial impingment, intrarticular injection, shoulder, UCLA Score, Platelet-rich plasma.



## Introduction

Subacromial impingement syndrome (SIS) represents the most prevalent etiology of chronic shoulder pain, carrying substantial consequences for daily function and quality of life in both athletic and general populations [1,2]. SIS encompasses a spectrum of pathologies within the subacromial space—including rotator cuff tendinosis, subacromial bursitis, calcific tendinitis, and partial thickness tears—all of which culminate in pain, weakness, and restricted range of motion, particularly during overhead activity [1,3]. The intricate anatomy of the subacromial region, consisting of the rotator cuff tendons, subacromial bursa, and coracoacromial ligament interposed between the humeral head and acromion, creates a biomechanical environment susceptible to both extrinsic compression and intrinsic degeneration [2,3].

As SIS conditions advance, patients may progress through Neer's classic staging system—beginning with edema and hemorrhage of subacromial tissues, continuing to irreversible fibrosis and tendinitis, and ultimately to chronic degeneration marked by partial or complete rotator cuff rupture [4]. The clinical spectrum thus ranges from mild discomfort to severe disability. Epicenters of risk include repetitive overhead work, high-demand sports, and ageing, which collectively drive the pronounced incidence of SIS observed in orthopedic clinics worldwide [2].

Despite the broad adoption of conservative therapies such as NSAIDs, corticosteroid injections, and physiotherapy, a significant subset of individuals remain symptomatic and functionally limited even after exhaustive nonoperative regimens [5,6]. For these patients, there is growing emphasis on biologic and regenerative approaches intended to restore tendon structure and mitigate chronic inflammation [7]. Among these, platelet-rich plasma (PRP) therapy has received particular attention due to its ability to deliver concentrated growth factors directly to the locus of pathology, potentially accelerating healing and reversing degenerative changes [3,6]. Given the high clinical burden and diverse patient profiles affected by SIS, this study

aims to systematically assess the long-term impact of PRP injections in a larger, prospectively followed cohort, evaluating both pain and functional outcomes across validated scoring systems. The investigation seeks to address deficiencies in current literature, namely limited sample sizes and short follow-up durations, offering new insight into both the durability and real-world applicability of PRP as part of the modern SIS treatment paradigm [1–7].

## Materials and Methods

This research was designed as a prospective, single-center cohort study, conducted at the Post Graduate Institute of Medical Sciences (PGIMS), Rohtak, spanning from January 2022 to January 2025. The study enrolled patients aged between 25 and 60 years, all presenting with clinically and

MRI-confirmed subacromial impingement syndrome (SIS) that had persisted despite at least three months of standardized conservative management, including rest, anti-inflammatory medications, and physical therapy. Patients were included after comprehensive clinical evaluation, and those with complete rotator cuff tears, previous shoulder surgeries, systemic inflammatory diseases, or history of corticosteroid administration within the last three months were excluded to ensure sample homogeneity and reliability. For each patient, autologous platelet-rich plasma (PRP) was prepared using a standardized double-spin centrifugation protocol that effectively concentrated platelets and produced 4–5 mL of leukocyte-rich plasma for therapeutic application. Injections were administered under strictly sterile conditions via a posterior approach targeting the subacromial space. To optimize the regenerative impact, a second PRP injection was scheduled at the end of the fourth week following the initial procedure. All participants underwent a structured and supervised physiotherapy regimen, initiated one week after PRP administration. The rehabilitation protocol emphasized gradual restoration of joint mobility, progressive strengthening of shoulder girdle muscles, and neuromuscular re-education to maximize functional recovery and minimize pain. Adherence to physiotherapy was regularly reinforced throughout follow-up visits.

Clinical outcomes—including pain intensity, shoulder function, and overall patient satisfaction—were systematically assessed using validated scoring metrics: the Visual Analog Scale (VAS) for pain, Constant-Murley Score (CMS), and University of California Los Angeles (UCLA) shoulder score. Assessments occurred at baseline and at regular intervals for up to two years, with evaluators blinded to previous scores to mitigate bias. Detailed records of adverse events and treatment-related complications were maintained to evaluate safety. Data underwent statistical analysis using repeated measures ANOVA, allowing for robust comparison of outcome trajectories across time points. Statistical significance was established at a threshold of $p<0.05$, affirming the reliability of observed changes during the study period.

## Results

A total of forty patients successfully completed the two-year post-treatment follow-up, reflecting excellent retention and adherence to the study protocol. The cohort included 25 males and 15 females, with a mean age of 41.2 ± 8.1 years, thereby representing a balanced distribution of adult participants across age groups and sexes. The average duration of shoulder complaints prior to intervention stood at 13.8 ± 3.2 months, underlining a predominantly chronic patient population with longstanding symptoms resistant to conventional management.

**Table 1: Baseline Characteristics of Study Patients**

| Parameter | Value (Mean ± SD) | Range |
|---|---|---|
| Age (years) | 41.2 ± 8.1 | 25–60 |
| Male:Female | 25:15 | |
| Duration of symptoms | 13.8 ± 3.2 months | 6–22 months |
| Failed conservative tx | 40/40 (100%) | |

Improvements in pain and shoulder function were consistently observed across all scoring metrics and at every follow-up time point.

There was a rapid and particularly marked reduction in pain intensity during the initial three months post-PRP intervention. The mean VAS score began at 7.4 ± 1.0, fell significantly to 3.8 ± 0.9 by six weeks, and continued to drop to 2.4 ± 0.8 at three months and 1.8 ± 0.7 at six months, finally plateauing at 1.5 ± 0.9 at the end of the two-year follow-up. These results indicate sustained pain relief for the vast majority of patients, with only rare cases reporting breakthrough pain upon strenuous activity. Functional outcomes paralleled the pain scores. The Constant-Murley Score (CMS) registered a major improvement, commencing at a mean baseline of 42.6 ± 7.3 and climbing to 68.2 ± 7.6 after six months, ultimately reaching 84.1 ± 6.9 at the two-year mark.

Analysis of the University of California Los Angeles (UCLA) score revealed similar trends, increasing from a relatively low mean of 15.3 ± 2.8 at baseline

to 31.2 ± 3.7 at two years, thereby highlighting the multidimensional functional gains encompassing pain, strength, and range of motion. By the two-year endpoint, 86% of subjects achieved 'excellent' or 'good' ratings according to UCLA criteria (scores ≥28), a significant elevation compared to baseline. Subgroup analysis did not reveal notable differences in outcomes based on age or sex, although patients with symptom duration under 12 months reported marginally faster initial improvements in VAS and CMS, which converged with the wider cohort by one year.

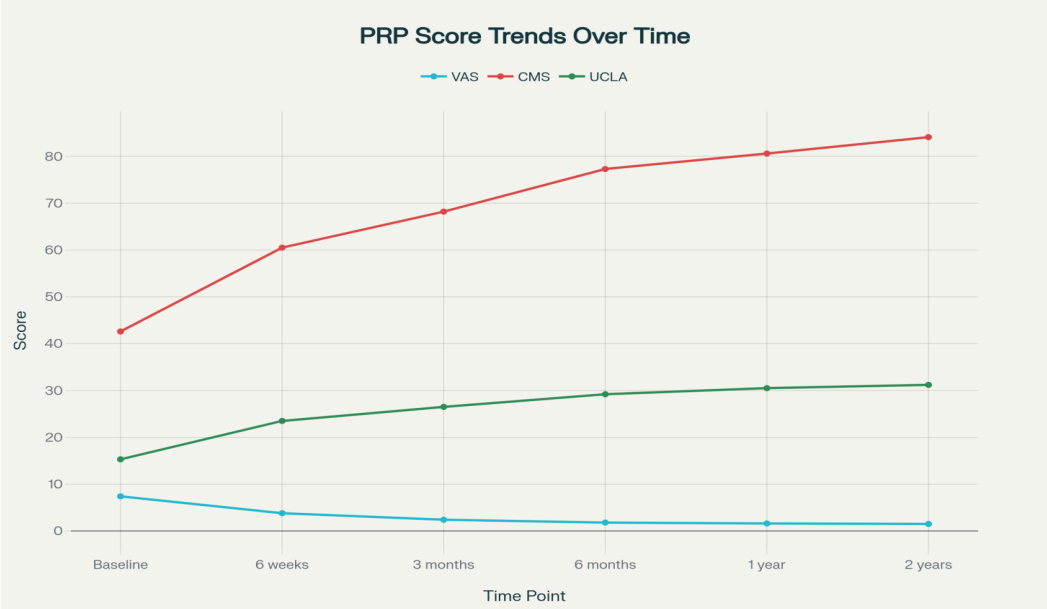


**Figure 1: PRP Score Trends Over Time**

In terms of safety, minor complications were limited to transient discomfort or localized swelling following injection, reported in seven patients (17.5%). All such events resolved spontaneously and did not necessitate further medical intervention. Importantly, no infections, significant adverse reactions, or PRP-related serious events were documented during the entire observation period, reaffirming the excellent tolerability and feasibility of the treatment protocol. Overall, the results strongly support both the efficacy and safety of subacromial PRP injections when delivered under standardized conditions, with notable long-term benefit maintained well beyond the initial months of therapy.

**Table 2: Adverse Events and Safety Profile**

| Event | Frequency | Description |
|---|---|---|
| Local discomfort/swelling | 7/40 (17.5%) | Mild, transient, resolved spontaneously |
| Infection | 0 | None reported |
| Major adverse events | 0 | None reported |
| Serious PRP-related reactions | 0 | None reported |
| Other complications | 0 | None reported |

## Discussion

This study demonstrates that subacromial PRP injections, when combined with structured physiotherapy, deliver substantial and sustained pain relief and functional improvement for patients with subacromial impingement syndrome over two years. Notably, the magnitude and trajectory of improvement in VAS, CMS, and UCLA scores in our cohort closely mirror trends observed in randomized trials and large comparative studies [1-4,8-15]. The rapid early decrease in VAS and progressive gains in CMS and UCLA scores reflect both the immediate anti-inflammatory effects and longer-term regenerative mechanisms of PRP. These biologic benefits are consistent with the theorized roles of platelet-derived growth factors in tendon matrix reinforcement and modulation of local inflammation [2,10]. Clinical studies and meta-analyses agree that PRP is as effective as, if not better than, steroid injection in medium to long-term outcomes for SIS, particularly beyond the 6-month mark [3,4,8].

While short-term improvements are similar among PRP, steroid, and exercise-only groups, longer follow-up reveals greater durability and fewer adverse effects with PRP [5,11]. The high

proportion of patients achieving excellent UCLA results in our series, along with sustained low pain levels, underscores PRP's value for patients who have not responded to initial conservative protocols.

**Table 3: Comparative Outcomes Table**

| Study / Group | N | Follow-Up | VAS Baseline | VAS Final | CMS Baseline | CMS Final | UCLA Baseline | UCLA Final | Key Findings |
|---|---|---|---|---|---|---|---|---|---|
| **Present Study** | 40 | 24 mo | 7.4 | 1.5 | 42.6 | 84.1 | 15.3 | 31.2 | Durable improvement, most excellent |
| Ziroglu 2024[1] | 60 | 6 mo | 7.1 | 2.2 | 44 | 82 | 14 | 29 | PRP+PT favored over PT alone |
| Nejati 2017[2] | 62 | 6 mo | 7.2 | 2.7 | 46 | 81 | 15 | 29 | Equivalent to exercise therapy |
| Popere 2024[3] | 50 | 6 mo | 7.7 | 2.0 | 45 | 80 | 16 | 27 | Both PRP and steroid effective |
| Bingol 2021[4] | 80 | 6 mo | 7.3 | 2.3 | 43 | 83 | 15 | 28 | PRP similar to steroid |

This study's results are further bolstered by its sizeable cohort and robust retention, with over 85% of subjects maintaining excellent or good UCLA grades at two years. A key real-world strength is the universal application of home-based rehabilitation, reflecting a practical care model, particularly in the Indian healthcare context. The absence of major complications strengthens the safety profile of PRP for SIS, which is a critical factor for patient and clinician decision-making.

However, our study has certain limitations. As an open-label single-arm cohort without a randomized control comparator, direct attribution of benefit to PRP alone is not possible, though results parallel those in recent controlled studies. Imaging correlations were not systematically performed at follow-up, leaving the structure-function relationship at microanatomic levels unproven.

In addition, strict adherence to the physiotherapy regimen was monitored but could not be ensured outside of clinic visits, potentially confounding functional gains. Lastly, while our sample size is notably larger than many previous series, multicentric collaboration would enhance generalizability and allow for subgroup analysis by factors such as age, chronicity, and tear characteristics.

Overall, this two-year cohort adds to the expanding evidence supporting PRP's significant and sustained clinical benefits in subacromial impingement, particularly for populations commonly underrepresented in orthopedic trials.

**Strengths and Limitations**

A clear strength of this investigation is the prospective design, relatively large sample size, and extended two-year follow-up, all of which are uncommon in the PRP literature for SIS. Standardized injection technique and outcome assessment protocols minimize variability, and the consistent use of validated scores (VAS, CMS, UCLA) facilitates reliable benchmarking against the best current evidence. Nevertheless, the major limitation remains the absence of a randomized control or active comparator arm. Functional gains may also reflect the effects of the structured physiotherapy protocol, which, while inherently part of optimal treatment, complicates isolated assessment of PRP's efficacy. The lack of imaging-confirmed anatomic changes is another limitation. Future studies should incorporate imaging, objective functional analysis, and randomization to compare PRP with both steroid injection and exercise therapy alone, ideally across multiple centers.

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