

## Efficacy of Triple-Dose Platelet-Rich Plasma Injection in Muroid Degeneration of the Anterior Cruciate Ligament: A Prospective Interventional Study

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Conflict of interest: Nil

### Abstract

**Background:** Muroid degeneration of the anterior cruciate ligament (ACL) is a recognized cause of chronic knee pain and restricted motion, often without instability. Conventional management ranges from conservative therapy to arthroscopic debridement, though neither directly addresses the underlying degenerative process. Platelet-rich plasma (PRP) has emerged as a biological treatment modality with regenerative potential.

**Aim:** To evaluate the clinical efficacy of three intra-articular PRP injections administered at 15-day intervals in patients with muroid degeneration of the ACL.

**Methods:** A prospective interventional study was conducted on 40 patients with MRI-confirmed muroid degeneration of the ACL who had persistent symptoms despite conservative treatment. Patients received three intra-articular PRP injections at 15-day intervals. Outcomes were assessed using Visual Analog Scale (VAS), International Knee Documentation Committee (IKDC) score, and range of motion (ROM) at baseline, 1 month, 3 months, and 6 months.

**Results:** Mean VAS score improved from  $7.6 \pm 0.9$  at baseline to  $2.3 \pm 0.8$  at 6 months ( $p < 0.001$ ). Mean IKDC score improved from  $42.5 \pm 6.2$  to  $82.1 \pm 5.4$  ( $p < 0.001$ ). Progressive improvement was observed across follow-ups, with notable clinical relief after the second injection. Range of motion improved particularly terminal flexion. No major complications were observed.

**Conclusion:** Triple-dose PRP therapy administered at 15-day intervals is a safe and effective treatment option for muroid degeneration of the ACL, offering significant pain relief and functional improvement while potentially avoiding surgical intervention.

**Keywords:** Muroid degeneration, ACL, PRP, Knee Pain, Regenerative Therapy.

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### Introduction

Muroid degeneration of the anterior cruciate ligament (ACL) is an increasingly recognized but frequently underdiagnosed condition characterized by interstitial accumulation of muroid material within the ligament. Unlike traumatic ACL injuries, patients typically present with chronic knee pain, restriction of terminal flexion, and preserved joint stability.

Magnetic resonance imaging (MRI) plays a key diagnostic role, with features such as ligament

thickening and increased intraligamentous signal intensity, often described as the “celery stalk” appearance.

Management strategies include conservative therapy and arthroscopic debridement. However, surgical intervention may compromise ligament integrity and does not directly reverse the degenerative process. Platelet-rich plasma (PRP), an autologous concentration of platelets containing growth factors

such as PDGF, TGF- $\beta$ , and VEGF, has demonstrated efficacy in various degenerative musculoskeletal conditions. Its potential role in intra-ligamentous degeneration, including mucoid degeneration of the ACL, remains relatively unexplored.

This study aims to evaluate the efficacy of a serial three-dose PRP injection protocol administered at 15-day intervals, hypothesizing that repeated dosing provides a cumulative regenerative effect.

## Materials and Methods

### Study Design:

Prospective interventional study conducted at NAMO medical education and research institute silvassa, orthopedic dept. between May 2025 and March 2026.

**Sample Size:** 40 patients.

### Inclusion Criteria

- Age 25–60 years
- MRI-confirmed mucoid degeneration of ACL
- Chronic knee pain (>3 months)
- Failure of conservative treatment ( $\geq 6$  weeks)

### Exclusion Criteria

- ACL tear or clinical instability
- Advanced osteoarthritis (Kellgren–Lawrence grade  $\geq 3$ )
- Prior knee surgery
- Inflammatory arthritis
- Coagulopathy or platelet disorders
- PRP Preparation and Injection Technique

Approximately 30 mL of venous blood was collected and processed using a double centrifugation technique to obtain PRP. The final volume (4–5 mL)

was injected intra-articularly via the anterolateral approach under strict aseptic precautions.

### Injection Protocol

Dose 1: Day 0

Dose 2: Day 15

Dose 3: Day 30

Patients were advised to avoid NSAIDs for one-week post-injection and to gradually resume activity with emphasis on range-of-motion exercises.

### Outcome Measures

- Pain: Visual Analog Scale (VAS)
- Function: IKDC Score
- Range of Motion (ROM)

### Follow-up

1 Month

3 Months

6 Months

**Statistical Analysis:** Data were expressed as mean  $\pm$  standard deviation. Paired t-test was used for comparison. A p-value < 0.05 was considered statistically significant.

## Results

### Demographic Profile

Mean age: 44.2 years

Male: 22 (55%)

Female: 18(45%)

**Pain Assessment (VAS):** A steady reduction in pain was observed over time.

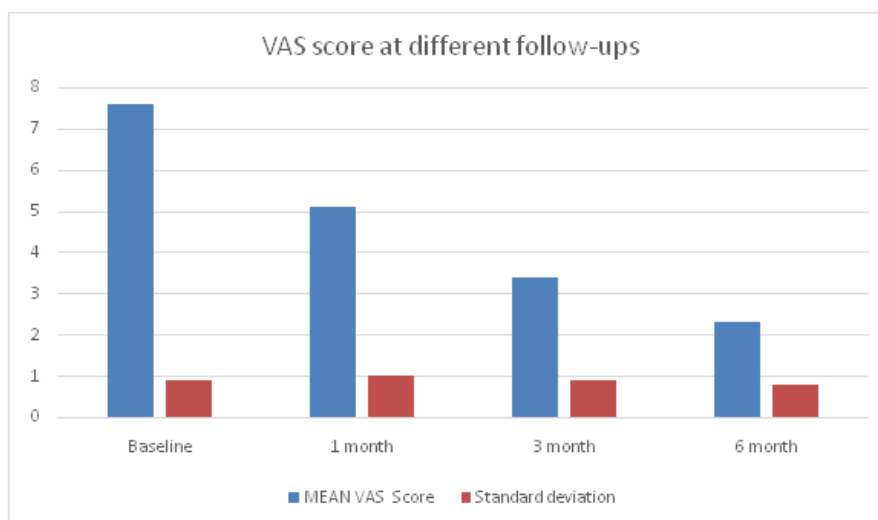


Figure 1: Progressive reduction in VAS score over 6 months following serial PRP injections (p < 0.001)

**Time Point Mean VAS**

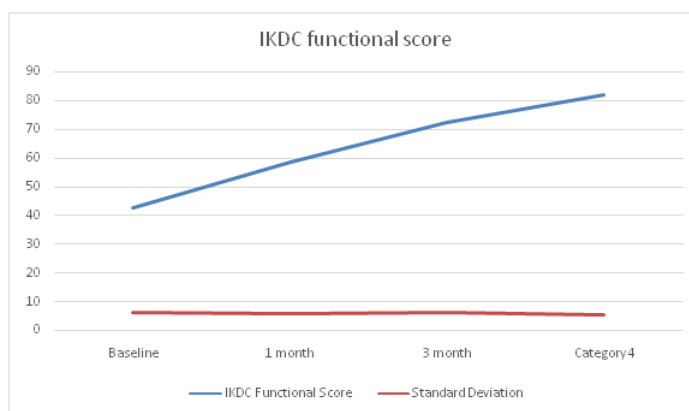
**Table 1:**

Baseline	7.6 ± 0.9
1 Month	5.1 ± 1.0
3 Months	3.4 ± 0.9
6 Months	2.3 ± 0.8

**Functional Outcome (IKDC Score)**

**Table 2:**

Time Point	Mean IKDC
Baseline	42.5 ± 6.2
1 Month	58.3 ± 5.8
3 Months	72.6 ± 6.1
6 Months	82.1 ± 5.4

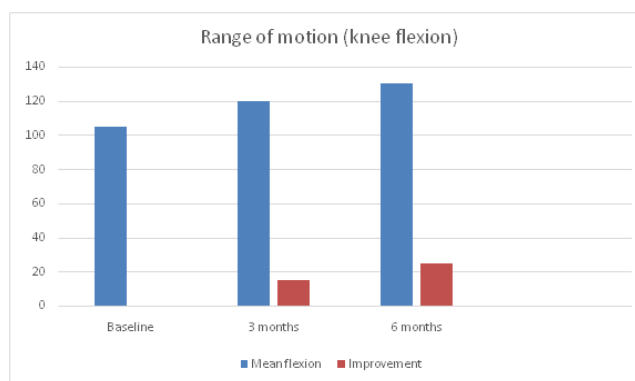


**Figure 2: Improvement in IKDC score across follow-up (p <0.001)**

**Range of Motion:** Knee flexion improved progressively, with reduction in terminal flexion pain.

**Table 3:**

Time Point	Mean Flexion
Baseline	105°
3 Months	120°
6 Months	130°



**Figure 3: Improvement in knee flexion in degree**

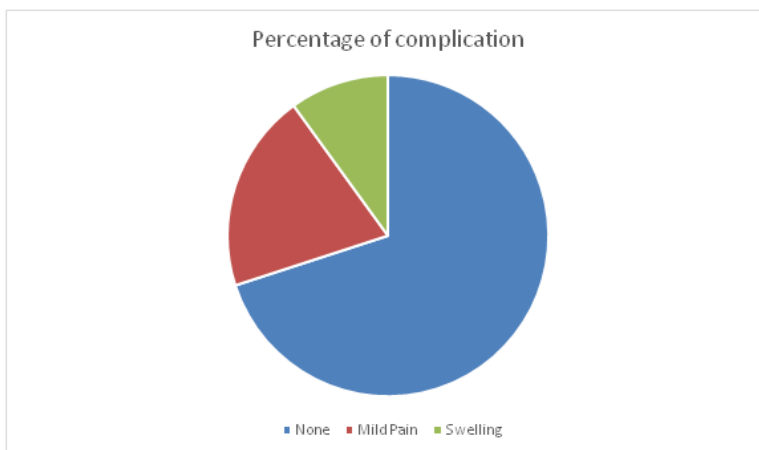
**Clinical Observations**

- Most patients reported noticeable improvement after the second injection
- Activities such as squatting and stair climbing improved early

- Terminal flexion pain reduced significantly

### Complications

- No complications: 70%
- Mild pain: 20%
- Transient swelling: 10%



**Figure 4: Post injection Complication distributions, highlighting the safety profile of PRP treatment**

### Discussion

The findings of this study suggest that serial PRP injections can provide significant clinical improvement in patients with mucoid degeneration of the ACL. The progressive improvement observed, particularly after the second and third injections, supports the concept of a cumulative biological effect. PRP may facilitate collagen remodeling and reduce intraligamentous degeneration through its growth factor-mediated action. While previous studies have demonstrated the effectiveness of PRP in conditions such as plantar fasciitis and osteoarthritis, its role in ligamentous degeneration has been less explored.

This study contributes to the growing evidence supporting PRP as a minimally invasive alternative to surgical management. In populations with high functional demands, including frequent squatting and cross-legged sitting, preserving ligament integrity while achieving symptom relief is particularly beneficial.

### Limitations

- Small sample size
- Lack of control group

- Short follow-up duration
- Absence of post-treatment MRI evaluation

### Conclusion

Triple-dose intra-articular PRP injections administered at 15-day intervals provide significant pain relief and functional improvement in patients with mucoid degeneration of the ACL.

This protocol represents a safe and effective non-surgical treatment option and may help delay or avoid the need for operative intervention.

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