

# A Prospective Study On The Functional Outcome Of Platelet Rich Plasma Injection In Lumbar Facet Arthropathy

Dr. Gils Thampi<sup>1</sup>, Dr. Nagakumar J.S<sup>2</sup>, Dr. Manoj Kumar Ramachandraiah<sup>3</sup>

<sup>1</sup>Senior Resident, Department of Orthopaedics, Sri Devaraj Urs Academy of Higher Education and Research, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India

<sup>2</sup>Professor & HOD, Department of Orthopaedics, Sri Devaraj Urs Academy of Higher Education and Research, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India

<sup>3</sup>Assistant Professor, Department of Orthopaedics, Sri Devaraj Urs Academy of Higher Education and Research, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India

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## Abstract

**Background:** Low back pain (LBP) is one of the most common musculoskeletal disorders worldwide and a major cause of disability. Although disc pathology is often emphasized, lumbar facet joints are recognized as important pain generators. Platelet-rich plasma (PRP), an autologous concentrate of platelets containing bioactive growth factors, has gained attention as a regenerative alternative to corticosteroids. This study aimed to evaluate the clinical and functional outcomes of fluoroscopy-guided intra-articular PRP injection in lumbar facet arthropathy (LFA) using the Visual Analog Scale (VAS) and Oswestry Disability Index (ODI).

**Materials and Methods:** A prospective observational study was conducted on seventy-one patients diagnosed with LFA at R. L. Jalappa Hospital, Kolar, between September 2022 and December 2023. All patients received 2 mL of autologous PRP injected intra-articularly under fluoroscopic guidance. Pain and functional outcomes were measured using VAS and ODI scores before the injection, immediately after, and at one week, one month, and three months. Statistical analysis was performed using paired t-tests, with  $p < 0.05$  considered significant.

**Results:** The mean age of patients was 51 years; 53.5% were male. Mean VAS improved from  $7.66 \pm 0.75$  pre-procedure to  $1.07 \pm 0.62$  at three months ( $p < 0.001$ ). Mean ODI improved from  $55.13 \pm 4.56$  to  $22.55 \pm 3.35$  ( $p < 0.001$ ). All improvements were statistically significant across time intervals. No major complications occurred.

**Conclusion:** Fluoroscopy guided intra-articular PRP injection significantly improves pain and functional outcomes in lumbar facet arthropathy. PRP is a safe, minimally invasive, and regenerative alternative to corticosteroid injections, offering sustained benefits for up to three months.

**Keywords:** Platelet rich plasma, lumbar facet arthropathy, low back pain, VAS, ODI, regenerative therapy

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## INTRODUCTION

Low back pain (LBP) is one of the most prevalent causes of musculoskeletal morbidity and functional impairment worldwide, affecting nearly 80% of individuals during their lifetime.<sup>1</sup> While intervertebral disc degeneration has traditionally been the focus, the lumbar facet joints are now recognized as a major source of chronic mechanical low back pain, contributing to 15–45% of cases.<sup>2,3</sup>

The lumbar facet joints are true synovial articulations with hyaline cartilage surfaces, a synovial lining, and a fibrous capsule richly innervated by the medial branches of the dorsal rami. Degenerative changes such as cartilage thinning, osteophyte formation, capsular hypertrophy, and subchondral sclerosis lead to joint dysfunction, instability, and pain.<sup>4,5,6</sup> Chronic mechanical stress induces local inflammation and the release of cytokines such as tumor necrosis factor-alpha (TNF- $\alpha$ ) and interleukin-1 $\beta$  (IL-1 $\beta$ ), perpetuating nociceptive pain pathways.

Conventional management, including analgesics, physical therapy, and intra-articular corticosteroids, offers only transient relief and may adversely affect cartilage health when used repeatedly.<sup>7</sup> Consequently, there is growing interest in regenerative therapies that target the biological basis of degeneration rather than merely alleviating symptoms.

Platelet-rich plasma (PRP) is an autologous blood-derived product containing a high concentration of platelets that release numerous growth factors, including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF- $\beta$ ), vascular endothelial growth factor (VEGF), and insulin-like growth factor (IGF). These bioactive molecules promote angiogenesis, tissue repair, and extracellular matrix synthesis.<sup>8,9,10,11</sup> PRP has been successfully used in osteoarthritis, tendinopathy, and intervertebral disc degeneration,<sup>12,13</sup> but data specific to lumbar facet arthropathy are limited, especially in the Indian population.

The present study was designed to assess the effectiveness of intra-articular PRP injections under fluoroscopic guidance in patients with lumbar facet arthropathy, evaluating pain relief and functional improvement through VAS and ODI scores.

## MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Orthopaedics, R. L. Jalappa Hospital and Research Centre, Sri Devaraj Urs Medical College, Kolar, from September 2022 to December 2023, following approval from the Institutional Ethics Committee. Informed written consent was obtained from all participants before inclusion.

Seventy-one patients aged above forty years with chronic mechanical low back pain due to lumbar facet arthropathy, confirmed clinically and radiologically (MRI evidence of facet degeneration), were included. Patients presented with localized paraspinal tenderness, pain aggravated by extension or rotation, and no neurological deficit. Individuals with previous spine surgery, coagulopathy, infection, uncontrolled diabetes, radiculopathy, or pregnancy were excluded from the study.

Autologous PRP was prepared by a double centrifugation technique. Between 50 and 75 mL of venous blood was drawn into a double blood bag containing anticoagulant. The first centrifugation at 2630 rpm for 3 minutes separated the plasma and buffy coat, which was then re-centrifuged at 1500 rpm for 15 minutes to yield 10–15 mL of PRP containing 4–5 times the baseline platelet concentration.

Under fluoroscopic guidance, the patient was placed prone with a pillow under the abdomen to reduce lumbar lordosis. After skin preparation and local anesthesia using 2% lignocaine, a 22-G spinal needle was advanced into the target facet joint. Two milliliters of PRP were injected intra-articularly under real-time fluoroscopic visualization. All procedures were performed by a single experienced spine surgeon to maintain consistency.

Pain intensity and functional disability were assessed using the Visual Analog Scale (VAS) and the Oswestry Disability Index (ODI) before the procedure, immediately after, and at one week, one month, and three months post-injection.

### Statistical Analysis

Data were analyzed using SPSS version 23 (IBM Corp., USA). Continuous variables were expressed as mean  $\pm$  standard deviation (SD), and categorical data as percentages. Paired t-tests were used to compare mean pre- and post-procedure values. Statistical significance was set at  $p < 0.05$ .

## RESULTS

**Table 1 : Demographic Characteristics (n = 71)**

Parameter	Value
Mean age (years)	51
Range (years)	41–75
Male n (%)	38 (53.5)
Female n (%)	33 (46.5)

The mean age of patients was approximately 51 years, confirming that lumbar facet arthropathy (LFA) predominantly affects the middle-aged and elderly populations. The near-equal gender distribution (53.5% male, 46.5% female) reflects that both sexes are equally susceptible once age-related degeneration sets in.

**Table 2 : Comorbidities**

Comorbidity	n = 76	%
Diabetes mellitus only	8	11.3
Hypertension only	8	11.3

Both DM + HTN	4	5.6
None	51	71.8

Most participants (71.8%) had no significant systemic illness. Diabetes and hypertension were the main associated conditions. The low prevalence of severe comorbidities implies that systemic factors did not confound the PRP response.

**Table 3 : Visual Analog Scale (VAS) Scores Before and After PRP Injection (n = 71)**

Time Interval	Mean ± SD	p-value
Pre-procedure	7.66 ± 0.75	—
Immediate Post-procedure	6.70 ± 0.72	< 0.001
1 Week	5.27 ± 0.76	< 0.001
1 Month	2.96 ± 0.75	< 0.001
3 Months	1.07 ± 0.62	< 0.001

There was a progressive and statistically significant reduction in VAS scores from a baseline of 7.66 to 1.07 at 3 months. The steep decline demonstrates effective and sustained pain relief, consistent with the regenerative action of PRP rather than temporary anti-inflammatory effects.

**Table 4 : Oswestry Disability Index (ODI) Scores Before and After PRP Injection (n = 71)**

Time Interval	Mean ± SD	p-value
Pre-procedure	55.13 ± 4.56	—
Immediate Post-procedure	52.90 ± 4.44	< 0.001
1 Week	45.44 ± 3.90	< 0.001
1 Month	33.69 ± 3.98	< 0.001
3 Months	22.55 ± 3.35	< 0.001

ODI scores improved significantly, showing a transition from severe disability at baseline to minimal disability by three months. This reflects enhanced mobility and daily functioning following PRP therapy.

**Table 5 : Mean Change in VAS and ODI Over Time**

Comparison (Pre vs Follow-up)	ΔVAS	ΔODI	p-value
Immediate	0.96	2.23	< 0.001
1 week	2.39	9.69	< 0.001
1 month	4.70	21.43	< 0.001
3 months	6.59	32.57	< 0.001

The incremental  $\Delta$ VAS and  $\Delta$ ODI values depict the cumulative therapeutic effect of PRP. The consistent  $p < 0.001$  across intervals reflects a sustained biologic action rather than a placebo or transient steroid-like response.

**Table 6 : Comparison with Similar Studies**

Study	Sample	Follow-up	VAS (Before→After)	ODI (Before→After)
Present study	71	3 months	7.66→1.07	55.13→22.55
Patel et al (2023) <sup>15</sup>	45	3 months	7.2→0.47	72.33→14.47
Wu et al (2017) <sup>5</sup>	46	6 months	7.8→2.1	56.0→30.4
Kirchner et al (2018) <sup>14</sup>	80	6 months	8.4→1.7	60.0→25.0
Kotb et al (2022) <sup>22</sup>	30	3 months	8.0→5.7	58.1→47.6

Cross-study comparison demonstrates that the current results align closely with the global literature. Mean pain reduction (~ 6.6 VAS points) and disability improvement (~ 33 ODI points) are equal to or superior to those in other studies.

## DISCUSSION

The present prospective study demonstrated that intra-articular PRP injection under fluoroscopic guidance provides significant, sustained improvement in pain and disability in lumbar facet arthropathy. The mean VAS decreased from 7.66 to 1.07, and ODI from 55.13 to 22.55 within three months, confirming both clinical and statistical significance.

Facet joints are vital load-bearing synovial articulations that resist shear forces and guide spinal movement. Degenerative changes lead to cartilage loss, osteophyte formation, and capsular hypertrophy, triggering inflammation and pain.<sup>1,2,3</sup> Corticosteroids have been widely used but provide only temporary relief and may inhibit chondrocyte proliferation and accelerate degeneration.<sup>7</sup>

PRP acts as a biologic enhancer of tissue repair. Platelets release a cascade of growth factors—PDGF, TGF- $\beta$ , VEGF, and IGF—that stimulate fibroblast proliferation, angiogenesis, and extracellular matrix regeneration.<sup>8,9,10,11</sup> PRP also suppresses pro-inflammatory cytokines such as IL-1 $\beta$  and TNF- $\alpha$  and downregulates NF- $\kappa$ B signalling.<sup>12,13</sup>

Our findings are consistent with those of Wu et al.<sup>5</sup>, who demonstrated a significant reduction in pain scores at six months following PRP injection for lumbar facet pain, and Kirchner et al.<sup>14</sup>, who reported durable outcomes over six months in chronic LFA. Patel et al.<sup>15</sup> observed almost 90% pain reduction in an Indian cohort, comparable to the present results. Akeda et al.<sup>16</sup> and Chen et al.<sup>17</sup> also confirmed PRP's superiority over steroids in chronic low back pain.

PRP's mechanism of action involves the restoration of the biochemical joint environment. Platelet  $\alpha$ -granules release PDGF and VEGF, promoting angiogenesis and nutrient diffusion.<sup>18</sup> TGF- $\beta$  enhances chondrocyte proliferation and collagen type II synthesis<sup>19</sup>, while PRP also inhibits matrix metalloproteinases (MMPs), reducing cartilage degradation.<sup>20,21</sup> These processes explain the gradual but sustained improvement observed in pain and function.

Compared with corticosteroids, PRP provides longer-lasting effects without systemic side effects.<sup>22</sup> Being autologous, it avoids the risks of immune reactions or infection. Its outpatient applicability, low cost, and minimal invasiveness make it an attractive option for degenerative spine conditions.

The improvement in both VAS and ODI indicates that PRP not only reduces nociception but also improves segmental stability and patient mobility. The delayed maximal effect seen at three months corresponds with tissue-level regenerative activity rather than a mere anti-inflammatory response. This study reinforces PRP's role as a safe, effective biologic therapy for facet-mediated back pain.

## Limitations

This study has several limitations, including a relatively small sample size, a single-center design, a short-term follow-up period, and the lack of a control group. Future multicenter randomized controlled trials

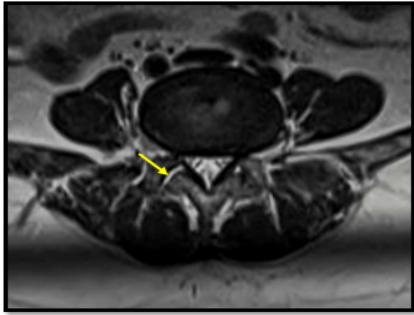
with long-term follow-up and standardized PRP preparation protocols are required to confirm these findings.

## CONCLUSION

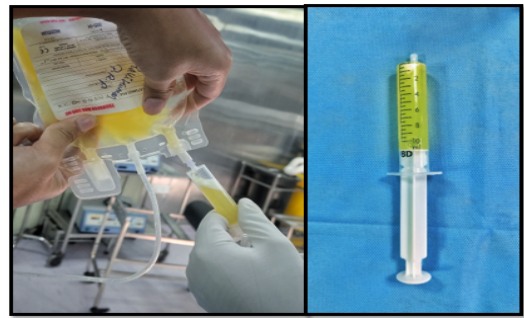
Fluoroscopically guided intra-articular PRP injection significantly reduces pain and improves functional outcomes in lumbar facet arthropathy. It provides a safe, autologous, and regenerative alternative to corticosteroid injections, with sustained benefits lasting up to three months. Further studies with larger sample sizes and longer follow-up periods are warranted to establish standardized treatment protocols.

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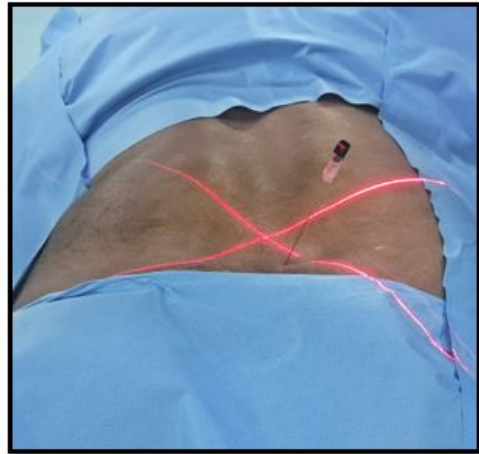
**Figure 1 : MRI T2 Axial section of Lumbar Spine at L3-L4 level with L3-L4 Right Lumbar Facet Arthropathy (yellow arrow)**



**Figure 2 : PRP aspirated in 10 cc syringe**



**Figure 3 : Positioning and Draping**



**Figure 4 : Insertion of 22 G spinal needle to Facet Joint under C-arm guidance**



**Figure 5 : C-arm image showing placement of needle in Right L3-L4 Facet Joint**



**Figure 6 : Under aseptic precautions, 2ml PRP being injected to Facet Joint**