Original Research Paper

Volume - 16 | Issue - 06 | June - 2026 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Orthopaedics

PLATELET-RICH PLASMA IN THE TREATMENT OF KNEE OSTEOARTHRITIS: A RANDOMIZED CONTROLLED TRIAL

Dr. Chennapatnam Vijaya Krishna 3rd Year Post Graduate, Department of Orthopaedics, Santhiram Medical College & General Hospital, Nandyal, Andhra Pradesh, India.

Dr. P. Sujith Deva Prasad DNB, Professor & HOD, Department of Orthopaedics, Santhiram Medical College & General Hospital, Nandyal.

Dr. P. Girija Devi MS, Assistant Professor, Department of Orthopaedics, Santhiram Medical College & General Hospital, Nandyal.

ABSTRACT **Background:** Knee osteoarthritis causes chronic pain and progressive functional limitation, and current treatments are largely symptomatic. Platelet-rich plasma (PRP) has emerged as a biologic option with potential anti-inflammatory and reparative effects. **Methods:** This randomized controlled trial compared intra-articular PRP with normal saline in 50 patients with mild-to-moderate knee osteoarthritis. Patients were evaluated using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and the Visual Analogue Scale (VAS) at baseline and follow-up visits. **Results:** Baseline characteristics were comparable between groups. The PRP group showed greater improvement in WOMAC composite score from 54.9 ± 7.3 to 39.2 ± 6.2, whereas the saline group changed from 53.5 ± 7.1 to 51.0 ± 7.2. WOMAC pain, stiffness, and physical function scores improved significantly in the PRP group, and VAS pain decreased from 68.0 ± 8.3 to 37.7 ± 11.2 compared with 67.5 ± 7.9 to 54.5 ± 11.8 in controls. Between-group differences became significant by 6 weeks and were more pronounced at 3 and 6 months. **Conclusion:** Intra-articular PRP provided sustained symptomatic benefit and superior functional improvement compared with saline in knee osteoarthritis.

KEYWORDS : knee osteoarthritis; platelet-rich plasma; randomized controlled trial; WOMAC; VAS

INTRODUCTION

Knee osteoarthritis is a progressive degenerative joint disease marked by cartilage loss, subchondral bone remodeling, synovial inflammation, pain, stiffness, and loss of function. It remains a major cause of disability and reduced quality of life in older adults. Conservative measures, analgesics, corticosteroid injections, and hyaluronic acid can reduce symptoms, but they do not modify the disease process.

Platelet-rich plasma (PRP) is an autologous blood product concentrated with platelets and growth factors such as platelet-derived growth factor, transforming growth factor beta, vascular endothelial growth factor, and insulin-like growth factor 1. These mediators may reduce synovial inflammation and support cartilage repair. Prior randomized trials and meta-analyses have suggested that PRP can improve pain and function in knee osteoarthritis, but outcomes vary with preparation methods, platelet concentration, and follow-up duration (Bennell et al., 2021; Belk et al., 2021; Filardo et al., 2021).

The present study evaluated whether intra-articular PRP offers superior symptom relief and functional improvement compared with saline in patients with knee osteoarthritis.

AIM & OBJECTIVES:

To evaluate the effectiveness of platelet rich plasma in reducing pain and improving physical function of knee joint.

- To evaluate the functional improvement in the cases with knee osteoarthritis following PRP injection.
- To assess the pain relief provided by PRP injection using standardized pain scoring system such as Visual Analogue Score.

MATERIALS AND METHODS

This was a randomized controlled trial conducted in the Department of Orthopaedics, Santhiram Medical College and Hospital, Nandyal, Andhra Pradesh, from April 2024 to March 2026. Fifty patients who completed follow-up were included in the final analysis, with 25 patients each in the PRP and saline groups.

Eligible patients had symptomatic mild-to-moderate knee osteoarthritis and provided informed written consent. Exclusion criteria included secondary osteoarthritis, inflammatory joint disease, connective tissue disorders, immunosuppression, and recent steroid injection. Baseline evaluation included demographic details, clinical examination, radiography, and routine laboratory tests where indicated.

Patients were randomized to receive either intra-articular autologous PRP or an equal volume of sterile normal saline. PRP was prepared under aseptic conditions from venous blood by a two-step centrifugation protocol and injected into the affected knee. Follow-up assessments were performed at 6 weeks, 3 months, and 6 months. Primary outcomes were pain and function measured by WOMAC and VAS. Data were analyzed using chi-square testing and independent t testing, with $p < .05$ considered statistically significant.

Preparation of PRP:

PRP for intra-articular injection was prepared under strict aseptic conditions in our hospital. About 12 mL of venous blood was drawn from the antecubital vein and collected in a PRP tube. The sample was first centrifuged at 1500 rpm for 15 minutes to separate its components. After this step, the upper plasma layer was carefully aspirated using a pipette and transferred into a sterile test tube. This sample underwent a second centrifugation at 3500 rpm for 7 minutes to further concentrate the platelets. Following the second spin, approximately 3–4 mL of platelet-rich plasma, including the platelet concentrate, was collected in a sterile syringe. The prepared PRP was then injected into the knee joint using an intra-articular approach under aseptic precautions.

RESULTS

The two groups were comparable at baseline. Mean age was 64.3 ± 6.1 years in the PRP group and 65.1 ± 5.9 years in the saline group. Female participants accounted for 56% in the PRP group and 52% in the saline group. Mean BMI was 26.1 ± 2.8 kg/m² in the PRP group and 26.4 ± 2.6 kg/m² in the saline group, indicating similar baseline body habitus.

Table 1 summarizes the baseline characteristics. The groups did not differ significantly with respect to age, gender distribution, height, weight, or BMI.

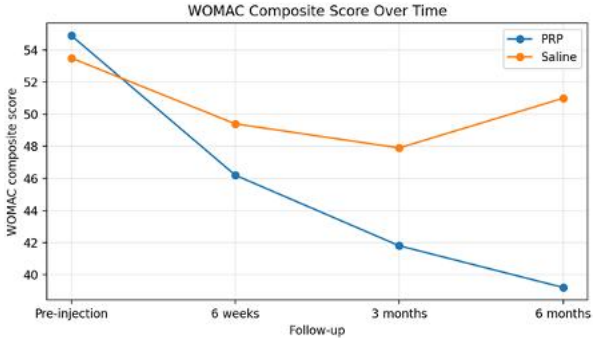

Figure 1. WOMAC composite score over time in the PRP and saline groups.

Table 1. Baseline characteristics of the study groups

Variable	PRP group	Saline group	P value
Age, years (mean ± SD)	64.3 ± 6.1	65.1 ± 5.9	0.56
Female, n (%)	14 (56)	13 (52)	0.78
Height, cm (mean ± SD)	168.2 ± 4.1	167.7 ± 4.0	0.63
Weight, kg (mean ± SD)	70.3 ± 6.2	71.1 ± 6.0	0.65
BMI, kg/m² (mean ± SD)	26.1 ± 2.8	26.4 ± 2.6	0.63

PRP produced a progressively larger reduction in WOMAC composite score over time. The score declined from 54.9 ± 7.3 at baseline to 46.2 ± 6.8 at 6 weeks, 41.8 ± 6.5 at 3 months, and 39.2 ± 6.2 at 6 months. In the saline group, the corresponding values were 53.5 ± 7.1, 49.4 ± 6.7, 47.9 ± 7.0, and 51.0 ± 7.2. Between-group differences were significant at 6 weeks (p = .038), 3 months (p = .001), and 6 months (p = .001).

Pain and function followed the same pattern. WOMAC pain score decreased from 16.2 ± 2.3 to 9.7 ± 1.8 in the PRP group, compared with 15.7 ± 2.1 to 15.3 ± 2.5 in the saline group. WOMAC stiffness fell from 5.1 ± 0.9 to 2.8 ± 0.6 with PRP and from 5.2 ± 0.8 to 4.9 ± 0.8 with saline. WOMAC physical function improved from 33.6 ± 4.1 to 26.7 ± 3.5 in the PRP group versus 32.5 ± 4.0 to 31.2 ± 4.1 in controls. VAS pain scores improved from 68.0 ± 8.3 to 37.7 ± 11.2 after PRP, compared with 67.5 ± 7.9 to 54.5 ± 11.8 after saline.

Table 2. Key clinical outcomes at baseline and final follow-up

Outcome	PRP baseline	PRP final follow-up	Saline final follow-up
WOMAC composite	54.9 ± 7.3	39.2 ± 6.2	51.0 ± 7.2
WOMAC pain	16.2 ± 2.3	9.7 ± 1.8	15.3 ± 2.5
WOMAC stiffness	5.1 ± 0.9	2.8 ± 0.6	4.9 ± 0.8
WOMAC function	33.6 ± 4.1	26.7 ± 3.5	31.2 ± 4.1
VAS pain	68.0 ± 8.3	37.7 ± 11.2	54.5 ± 11.8

DISCUSSION

This trial showed that intra-articular PRP was associated with sustained improvement in pain, stiffness, and physical function compared with saline. The between-group separation became clear by 6 weeks and widened at 3 and 6 months, suggesting a durable therapeutic effect rather than a short-lived placebo response.

These findings are consistent with earlier randomized trials and meta-analyses indicating that PRP can outperform placebo or hyaluronic acid for early knee osteoarthritis, especially in pain and function outcomes (Riboh et al., 2022; Tang et al., 2022; Shen et al., 2020). The temporal pattern observed here is also in line with reports that PRP benefit often increases over follow-up, likely because biologic modulation of inflammation and matrix repair takes time to translate into clinical improvement.

Several mechanisms may explain the observed benefit. Platelet-derived growth factors can influence chondrocyte activity, reduce synovial inflammation, and support extracellular matrix synthesis. The autologous nature of PRP may also limit immunogenicity and make it a practical option for selected patients with mild-to-moderate disease. Recent reviews suggest that preparation protocol, leukocyte content, and platelet concentration can modify outcomes, which may partly explain variation across studies (Moretti et al., 2022; Simental-Mendía et al., 2021).

The main strength of this study is the randomized comparison with a saline control and the use of validated patient-reported outcome measures. The main limitation is the modest sample size and single-center design, which may reduce generalizability. Longer follow-up and standardized PRP characterization would strengthen future studies.

CONCLUSION

Intra-articular PRP produced greater and more sustained improvement than saline in knee osteoarthritis, with significant reductions in WOMAC and VAS scores by 3 and 6 months. The findings support PRP as a useful biologic treatment option for symptomatic mild-to-moderate knee osteoarthritis.

REFERENCES

1. Bennell, K. L., Paterson, K. L., Metcalf, B. R., Duong, V., Eyles, J., Kasza, J., et al. (2021). Effect of intra-articular platelet-rich plasma vs placebo injection on pain and medial tibial cartilage volume in patients with knee osteoarthritis. JAMA, 326(20), 2021–2030.
2. Belk, J. W., Kraeutler, M. J., Houck, D. A., McCarty, E. C., & Bravman, J. T. (2021). Platelet-rich plasma versus hyaluronic acid for knee osteoarthritis: A systematic review and meta-analysis. American Journal of Sports Medicine, 49(1), 249–260.
3. Filardo, G., Kon, E., Di Matteo, B., Di Martino, A., Merli, G., Cenacchi, A., et al. (2021). Platelet-rich plasma injections for the treatment of knee osteoarthritis: A meta-analysis of randomized controlled trials. Cartilage, 13(Suppl 1), 364S–375S.
4. Shen, L., Yuan, T., Chen, S., Xie, X., & Zhang, C. (2020). The temporal effect of platelet-rich plasma on pain and physical function in the treatment of knee osteoarthritis: Systematic review and meta-analysis of randomized controlled trials. Journal of Orthopaedic Surgery and Research, 15(1), 403–414.
5. Riboh, J. C., Saltzman, B. M., Yanke, A. B., Fortier, L., & Cole, B. J., et al. (2022). Platelet-rich plasma for knee osteoarthritis: Systematic review. Arthroscopy, 38(1), 229–239.
6. Tang, J. Z., Nie, M. J., Zhao, J. Z., Zhang, G. C., & Zhang, L. Y. (2022). Platelet-rich plasma versus hyaluronic acid in knee osteoarthritis. Clinical Rheumatology, 41(2), 447–459.
7. Moretti, L., Maccagnano, G., Coviello, M., Cassano, G. D., Franchini, A., Laneve, A., et al. (2022). Platelet rich plasma injections for knee osteoarthritis treatment: A prospective clinical study. Journal of Clinical Medicine, 11(9), 2640.
8. Raeissadat, S. A., Rayegani, S. M., Babaee, M., & Ghorbani, E. (2013). The effect of platelet-rich plasma on pain, function, and quality of life of patients with knee osteoarthritis. Pain Research and Treatment, 2013, 165967.
9. Khuba, S., Khetan, D., Kumar, S., Garg, K. K., Gautam, S., & Mishra, P. (2023). Role of platelet rich plasma in early knee osteoarthritis pain. Interventional Pain Medicine, 2(4), 100297.