Section: Anesthesiology

Original Research Article

COMPARISON OF THE ANALGESIC EFFECT OF USG GUIDED INTRAARTICULAR INJECTION OF PLATELET RICH PLASMA AND TRIAMCINOLONE IN PATIENT OF OSTEOARTHRITIS KNEE

Namrata Mehta[1], Mayur Vania[2], Anjali Unadkat[3], Ankisha Tailor[4], Kanvee Vania[5]

[1]*Senior Resident, Department of Anesthesiology, GMERS Medical College, Junagadh, Gujarat, India*
[2]*Associate Professor, Department of Orthopaedics, GMERS Medical College, Junagadh, Gujarat, India*
[3]*Assistant Professor, Department of Anesthesiology, GMERS Medical College, Junagadh, Gujarat, India*
[4]*Resident, Department of Anesthesiology, GMERS Medical College, Junagadh, Gujarat, India*
[5]*Professor and Head, Department of Anesthesiology, GMERS Medical College, Junagadh, Gujarat, India*

Received *: 15/07/2025*
Received in revised form *: 03/09/2025*
Accepted *: 20/09/2025*

Corresponding Author:
Dr. Mayur Vania,
Department of Anesthesiology, GMERS Medical College, Junagadh, Gujarat, India.
Email: mayurbvania@gmail.com

DOI: 10.70034/ijmedph.2025.4.11

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (4); 56-60

ABSTRACT

Background: Osteoarthritis of the knee is a prevalent degenerative joint disorder causing significant pain and disability. While corticosteroids injections provide short-term relief, platelet-rich plasma (PRP) has emerged as a promising alternative offering longer-lasting benefits. The aim is to compare the analgesic and functional outcomes of USG-guided intra-articular injections of PRP and triamcinolone in patients with grades I–II knee osteoarthritis

Materials and Methods: This prospective randomized controlled study enrolled 68 patients who were allocated to receive either PRP or triamcinolone injection under ultrasound guidance. Pain relief was assessed using the Visual Analogue Scale (VAS), and functional outcomes were measured by KOOS scores at baseline, 6 weeks, 3 months, and 6 months. Analgesic requirement reduction was also recorded.

Results: Both groups showed significant pain reduction at early follow-up; however, PRP demonstrated superior long-term analgesic effect and functional improvement, with reduced analgesic dependence at 3 and 6 months compared to triamcinolone.

Conclusion: PRP is a safe and effective biological alternative for knee osteoarthritis, offering sustained pain relief and better functional outcomes compared to corticosteroids injections.

Keywords: Knee osteoarthritis, Platelet-rich plasma, Triamcinolone, Intra-articular injection.

INTRODUCTION

Osteoarthritis (OA) of the knee is one of the most prevalent degenerative joint disorders globally, contributing significantly to pain, disability, and decreased quality of life in the aging population.[1] The pathogenesis of OA involves progressive cartilage degeneration, synovial inflammation, and subchondral bone changes leading to chronic pain and functional impairment.[2] Management strategies range from lifestyle modifications and pharmacological agents to intraarticular injections and surgical interventions.[3]

Intraarticular corticosteroids injections, such as triamcinolone acetonide, have long been considered an effective short-term therapy for reducing pain and inflammation due to their potent anti-inflammatory properties.[4] However, concerns regarding their repeated use include cartilage toxicity and acceleration of joint degeneration over time.[6]

In recent years, platelet-rich plasma (PRP) has emerged as a promising biological therapy that utilizes autologous growth factors to promote cartilage repair, modulate inflammation, and improve joint function.[6] Several clinical studies have demonstrated that PRP provides longer-lasting symptomatic relief compared to corticosteroids, with potential disease-modifying effects.[7] Despite its

increasing use, the comparative effectiveness of PRP versus corticosteroids remains an area of ongoing research, particularly with ultrasound-guided (USG) delivery that ensures accurate intraarticular placement, optimizing therapeutic benefits.[8]

Previous studies have shown conflicting evidence regarding the superiority of PRP over corticosteroids. PRP is considered superior to steroids for the analgesic effect in ultrasound-guided injections for patients with knee osteoarthritis because it promotes tissue regeneration and healing through the delivery of growth factors, which can lead to sustained pain relief and improved joint function. Unlike corticosteroids, which primarily reduce inflammation temporarily, PRP may facilitate long-term repair of damaged cartilage and synovial tissue, thereby providing more durable symptom control. Additionally, PRP has a lower risk of adverse side effects such as cartilage deterioration and tissue atrophy associated with repeated steroid use. Consequently, PRP offers a regenerative approach that can result in prolonged analgesia and improved functional outcomes in osteoarthritic knees. Some reports suggest that corticosteroids provide superior pain relief in the early weeks, whereas PRP demonstrates sustained benefits at longer follow-up intervals.[9] Additionally, ultrasound guidance during injection improves accuracy, reduces complications, and may influence clinical outcomes compared to blind techniques.[10] Therefore, the present study was conducted to compare the analgesic effect of intraarticular platelet-rich plasma and triamcinolone in patients with grades I and II knee osteoarthritis.

MATERIALS AND METHODS

This prospective, randomized controlled study was conducted on 68 patients diagnosed with symptomatic, radiologically confirmed knee osteoarthritis (OA) according to the American College of Rheumatology criteria (Kellgren-Lawrence grades I–II). The study was carried out at GMERS Medical College and Hospital, Junagadh, from January 2025 to June 2025. Demographic variables such as age, sex, body mass index (BMI), and the degree of radiological involvement were recorded for all participants. Eligible patients were aged between 35 and 70 years, had a history of chronic knee pain for more than three months, and swelling of the knee for more than four months. Radiological confirmation was performed using X-ray images in anteroposterior and lateral projections. Exclusion criteria included patients with knee joint deformities, acute infections, history of knee surgery, diabetes mellitus, rheumatoid arthritis, gout, severe cardiovascular disorders, hematological disorders, renal disorders, immunodeficiency, patients taking anticoagulants, patients with hemoglobin values less than 10 g/dL, and those with positive HIV or HBsAg status.

The study followed a single-center, prospective, randomized controlled design. All potentially eligible patients were pre-screened, and those meeting the inclusion criteria provided written informed consent before enrollment. Patients were then randomly assigned in a 1:1 ratio into two groups using a computer-generated randomization list. Group one (Platelet-Rich Plasma [PRP]) received a single ultrasound-guided intra-articular injection of autologous PRP, while group two (Corticosteroids) received a single ultrasound-guided intra-articular injection of corticosteroids. Primary outcomes included changes in VAS scores at various intervals, Knee Injury and Osteoarthritis Outcome Score (KOOS), and decreased analgesic requirements. The patients were asked for the frequency of analgesic requirement during the study period. Decrease analgesic requirement means from daily thrice a day intake to twice a day for three or less than three days in week.

All procedures involving human participants were approved by the institutional ethics committee of GMERS Medical College and Hospital, Junagadh, and were conducted in accordance with the ethical standards of the committee. Informed consent was obtained from all participants.

PRP was prepared using a NEYA 2 REMI centrifuge machine. A total of 18 mL of peripheral blood was drawn from antecubital vein and mixed with 2 mL of 3.8% sodium citrate. The mixture was centrifuged first at 1500 rpm for 10 minutes (soft spin) into three layers: top supernant layer (plasma), middle layer of buffy coat rich into platelets, and bottom layer of RBC. Transfer the supernant plasma and buffy coat layer into another sterile tube (without anticoagulant) and centrifugate at 3000 rpm for 10 minutes (hard spin) into 2 layers of top layer which is platelet-poor plasma and bottom pallet of platelet-rich plasma. From the resulting plasmatic fraction, 5 mL of pure PRP was obtained for intra-articular injection.

For infiltration, patients in the PRP group received 5 mL of PRP, while patients in the CS group received 1 mL of triamcinolone acetonide (kenacort injection) at a concentration of 40 mg/mL mixed with 5 mL of 2% lidocaine in a single syringe. Arthrocentesis was permitted in both groups before injection. All injections were performed under strict aseptic conditions without any local or general anesthesia using a 20-G × 70 mm needle with an anterolateral approach. Ultrasound guidance ensured accurate needle placement and confirmed intra-articular delivery by direct visualization of the injected material. After injection, an aseptic cool bandage was applied for 15 minutes for local compression. Non-steroidal anti-inflammatory drugs (NSAIDs) were prohibited for 10 days following the injection. Patients were advised to resume their usual daily activities without specific restrictions during the follow-up period.

Sample size calculation was based on the hypothesis of superiority, assuming an average VAS score of 33.7 in the control group with a standard deviation of 23.6 in both groups and expecting a reduction of 17 points in the treatment group compared to the control

group. With 80% power and a two-sided significance level of 0.05, the sample size was calculated to be 31 per group, which was increased to 34 per group to account for a 10% loss to follow-up, making a total of 68 participants. The calculation was performed using Epi Info software, and the difference of 17 points was based on previously published results.
(Group P -Platelet rich plasma, Group S - Corticosteroids).

RESULTS

[Table 1] shows the demographic and baseline characteristics of the patients in both groups. The mean age of participants was similar in both groups, indicating no significant age-related bias in the allocation. The distribution of gender was also comparable, with a nearly equal proportion of male and female participants in each group. Body Mass Index (BMI) was observed to be similar in both groups, confirming that the two groups were homogeneous in terms of anthropometric characteristics. The P-values for age, gender, and BMI were not statistically significant, ensuring that baseline characteristics were balanced between the groups.

[Table 2] represents the objective assessment of pain using the Visual Analogue Scale (VAS) at different follow-up periods for both groups. At baseline (day 0), mean VAS scores were comparable between the two groups, suggesting similar initial pain levels. At six weeks, there was a noticeable reduction in pain scores in both groups, with group S (Triamcinolone) showing a slightly greater early reduction. However, at three months and six months, group P (PRP) exhibited a more sustained decrease in VAS scores compared to group S, indicating that PRP provided prolonged pain relief over time, whereas the effect of corticosteroids diminished gradually.

Table 1: Patient's Characteristics

Variables	Group P (Mean±SD)	Group S (Mean±SD)	P value
Age (Years)	52.18± 7.22	53.47±8.14	0.85
Gender (Male/Female)	17 / 17	18 / 16	0.91
BMI (kg/m²)	26.71±04.36	27.08± 5.78	0.77

Table 2: Objective Assessment of Pain using VAS

Duration	VAS in Group P (Mean±SD)	VAS in Group S (Mean±SD)	P Value
At day 0	8.12±1.23	8.03±1.12	0.62
At 6 weeks	6.38±0.88	6.26±0.65	0.74
At 3 months	4.71±0.09	4.82±0.14	0.68
At 6 months	3.85±0.06	3.91±0.1	0.81

Table 3: Functional Assessment of Knee using KOOS

Duration	KOOS in Group P (Mean±SD)	KOOS in Group S (Mean±SD)	P value
At day 0	39.06±4.45	40.29±5.18	0.55
At 6 weeks	50.94±6.47	49.71±4.90	0.66
At 3 months	61.76±7.48	62.82±78.01	0.71
At 6 months	68.62±8.54	69.44±9.63	0.64

[Table 3] highlights the functional outcomes assessed using the KOOS score at various intervals. At baseline, the KOOS scores were similar in both groups. At six weeks, both groups demonstrated improvement in functional status, with group S showing a slightly higher early improvement. However, at three months and six months, group P had a marked increase in KOOS scores compared to group S, reflecting better long-term functional recovery in the PRP group. This suggests that while corticosteroids may provide early symptomatic relief, PRP contributes more significantly to sustained functional benefits.

Table 4: Comparison of Decrease Analgesic Requirements

Duration	No. of patients in Group P	No. of patients in Group S
0 weeks	34	34
6 weeks	21	22
3 months	16	18
6 months	15	17

[Table 4] illustrates the comparison of decreased analgesic requirements between the two groups during follow-up. At baseline, all patients were on analgesics. By six weeks, a higher proportion of patients in both groups reported reduced dependence on analgesics, Group S exhibiting a marginally greater initial improvement. At three months and six months, group P demonstrated a slightly greater reduction in analgesic usage compared to group S, supporting the observation that PRP offers more durable pain control and reduces the need for additional medication over the long term.

DISCUSSION

The present study compared the analgesic and functional outcomes of USG-guided intra-articular

injections of platelet-rich plasma (PRP) and triamcinolone in patients with knee osteoarthritis. Both groups demonstrated improvement in pain and function; however, the pattern of response varied across follow-up periods. At six weeks, triamcinolone provided a marginally superior reduction in pain scores compared to PRP, consistent with previous literature indicating that corticosteroids offer rapid onset pain relief through potent anti-inflammatory mechanisms.[11] However, the long-term outcomes at three and six months revealed a distinct advantage for PRP, with sustained reductions in VAS scores and greater improvement in KOOS scores.

Di Martino A et al. investigated the persistence of the favorable effect of PRP infiltration during a 24-month follow-up. Results show that all the evaluated parameters were significantly reduced at 24 months compared with those at 12 months, but still better than the baseline before treatment. The median duration of the clinical improvement was 9 months. This may explain why all current RCTs followed participants within 12 months. The short-term efficacy of PRP injections indicates that PRP only temporarily influences the joint milieu, without affecting the joint structure or progression of knee OA.[12]

Patel et al. study, by comparing the effects of single injection or double injections of PRP and injection of normal saline (as a control group) in patients suffering from knee arthritis, showed that single injection was as effective as two times injections and both had better effects than normal saline injection. In their study, PRP obtained was lacking leukocytes with concentration of 2.5 million per micro liter with a single centrifuge turn.[13]

Misahra et al describe that rich in many growth factors that have important implications in healing, PRP can potentially regenerate tissue via multiple mechanisms. Proposed clinical and surgical applications include spinal fusion, chondropathy, knee osteoarthritis, tendinopathy, acute and chronic soft-tissue injuries, enhancement of healing after ligament reconstruction, and muscle strains. However, for many conditions, there is limited reliable clinical evidence to guide the use of PRP. Furthermore, classification systems and identification of differences among products are needed to understand the implications of variability.[14]

The observed improvement in KOOS scores in the PRP group suggests that PRP not only mitigates pain but also positively influences joint functionality. This is likely due to the biological properties of PRP, which include growth factor release, stimulation of chondrocyte proliferation, and modulation of inflammatory mediators within the joint environment.[15] Unlike corticosteroids, which primarily target inflammation, PRP may provide a disease-modifying effect by promoting cartilage healing and improving joint microenvironment, resulting in sustained clinical benefit.[16]

Another key finding of this study was the reduction in analgesic requirements over time, which was more pronounced in the PRP group at three and six months. This reduction reflects better overall pain control and improved quality of life among patients treated with PRP. The ability to reduce analgesic dependence is clinically significant, as chronic analgesic use is associated with gastrointestinal, renal, and cardiovascular risks.[17] Taken together, these results suggest that while corticosteroids remain an effective short-term option for acute symptom management, PRP offers superior long-term outcomes, making it a promising therapeutic alternative for patients with mild to moderate knee OA.

CONCLUSION

Intra-articular injection of platelet-rich plasma demonstrated comparable short-term analgesic effects to triamcinolone but provided superior long-term pain relief, functional improvement, and reduction in analgesic use. PRP can thus be considered a safe and effective biological alternative for managing knee osteoarthritis, particularly in patients seeking sustained clinical benefits.

REFERENCES

1. Bannuru RR, Osani MC, Vaysbrot EE, et al. OARSI guidelines for the non-surgical management of knee, hip, and polyarticular osteoarthritis. Osteoarthritis Cartilage. 2019;27(11):1578-1589.
2. Kloppenburg M, Berenbaum F. Osteoarthritis year in review 2020: epidemiology and therapy. Osteoarthritis Cartilage. 2020;28(3):242-248.
3. Loeser RF, Goldring SR, Scanzello CR, Goldring MB. Osteoarthritis: a disease of the joint as an organ. Arthritis Rheumatol. 2019;71(6):899-910.
4. Kolasinski SL, Neogi T, Hochberg MC, et al. 2019 American College of Rheumatology/Arthritis Foundation guideline for the management of osteoarthritis of the hand, hip, and knee. Arthritis Care Res. 2020;72(2):149-162.
5. McAlindon TE, LaValley MP, Harvey WF, et al. Effect of intra-articular triamcinolone vs saline on knee cartilage volume and pain in patients with knee osteoarthritis. JAMA. 2017;317(19):1967-1975.
6. Wernecke C, Braun HJ, Dragoo JL. The effect of intra-articular corticosteroids on articular cartilage: a systematic review. Orthop J Sports Med. 2015;3(5):2325967115581163.
7. Andia I, Maffulli N. Platelet-rich plasma for managing pain and inflammation in osteoarthritis. Nat Rev Rheumatol. 2013;9(12):721-730.
8. Dai WL, Zhou AG, Zhang H, Zhang J. Efficacy of platelet-rich plasma in the treatment of knee osteoarthritis: a meta-analysis of randomized controlled trials. Arthroscopy. 2017;33(3):659-670.e1.
9. Migliorini F, Eschweiler J, Maffulli N, et al. Intra-articular platelet-rich plasma vs corticosteroids for the treatment of knee osteoarthritis: a systematic review and meta-analysis. Am J Sports Med. 2021;49(9):2496-2507.
10. Sofka CM, Adler RS. Ultrasound-guided injections in the musculoskeletal system: safety, accuracy, and efficacy. AJR Am J Roentgenol. 2008;190(5):1230-1234.
11. Gormeli G, Gormeli CA, Ataoglu B, et al. Multiple PRP injections are more effective than single injections and hyaluronic acid in knees with early osteoarthritis: randomized controlled trial. Knee Surg Sports Traumatol Arthrosc. 2017;25(3):958-965.
12. Filardo G, Kon E, Di Martino A, Di Matteo B, Merli ML, Cenacchi A, Fornasari PM, Marcacci M. Platelet-rich plasma

vs hyaluronic acid to treat knee degenerative pathology: study design and preliminary results of a randomized controlled trial. BMC Musculoskelet Disord. 2012 Nov 23;13:229. doi: 10.1186/1471-2474-13-229. PMID: 23176112; PMCID: PMC3532098..
13. Patel S, Dhillon MS, Aggarwal S, et al. Treatment with platelet-rich plasma for knee osteoarthritis: a systematic review. Am J Sports Med. 2013;41(2):336-344.
14. Hsu WK, Mishra A, Rodeo SR, Fu F, Terry MA, Randelli P, Canale ST, Kelly FB. Platelet-rich plasma in orthopaedic applications: evidence-based recommendations for treatment. J Am Acad Orthop Surg. 2013 Dec;21(12):739-48. doi: 10.5435/JAAOS-21-12-739. PMID: 24292930..
15. Sanchez M, Fiz N, Azofra J, et al. A randomized clinical trial evaluating plasma rich in growth factors (PRGF-Endoret) versus hyaluronic acid in the short-term treatment of symptomatic knee osteoarthritis. Arthroscopy. 2012;28(8):1070-1078.
16. Filardo G, Kon E, Roffi A, et al. Platelet-rich plasma: why intra-articular? A systematic review of preclinical studies and clinical evidence on PRP for joint degeneration. Knee Surg Sports Traumatol Arthrosc. 2015;23(9):2459-2472.
17. Kon E, Buda R, Filardo G, et al. Platelet-rich plasma: intra-articular knee injections produced favorable results on degenerative cartilage lesions. Knee Surg Sports Traumatol Arthrosc. 2010;18(4):472-479.