

Case Series

Results of platelet-rich plasma intra-articular injection in all stages of osteoarthritis of the knee

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ABSTRACT

Osteoarthritis (OA) of the knee is a common degenerative joint disorder leading to chronic pain, stiffness, and functional limitation. Conventional treatments provide only symptomatic relief and do not reverse the disease process. Platelet-rich plasma (PRP), a regenerative therapy rich in growth factors, has emerged as a promising modality for improving joint function and reducing pain in OA. Aim was to evaluate the clinical outcomes of intra-articular PRP injections in patients with knee OA across different stages. This prospective case series included 10 patients with knee OA treated with a single intra-articular PRP injection. PRP was prepared by centrifugation at 2200 rpm for 8 minutes and injected using an inferolateral approach under aseptic precautions. Patients were followed up at 48 hours, 1 month, 3 months, and 6 months. Outcome measures included pain assessment using the visual analogue scale (VAS) and functional evaluation using WOMAC and knee society score (KSS). The mean VAS score significantly decreased from 7.5 ± 1.1 at baseline to 3.4 ± 1.3 at 6 months, indicating substantial pain relief. Functional outcomes showed progressive improvement, with WOMAC scores decreasing and KSS scores increasing over time. Eight patients (80%) showed significant improvement, while two patients (20%) demonstrated moderate improvement, particularly in advanced stages of OA. Patients with early-stage disease showed better response compared to those with severe disease. No major adverse effects were observed. Intra-articular PRP injection is a safe and effective treatment for knee OA, providing significant pain relief and functional improvement, especially in early to moderate stages. It can be considered a promising non-surgical option for managing knee OA.

Keywords: Platelet-rich plasma, Knee osteoarthritis, VAS score, WOMAC score, Knee Society Score, Intra-articular injection, Case series, Regenerative therapy

INTRODUCTION

Osteoarthritis (OA) of the knee is one of the most common chronic degenerative joint disorders and a leading cause of pain and disability, particularly in the elderly population. It is characterized by progressive cartilage degeneration, subchondral bone changes, synovial inflammation, and loss of joint function, ultimately leading to reduced quality of life.¹ The global burden of knee OA is increasing due to aging population, rising obesity rates, and sedentary lifestyle, making it a significant public health concern.² Conventional management of knee OA includes pharmacological therapies such as analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), intra-

articular corticosteroids, and hyaluronic acid injections. However, these treatments mainly provide symptomatic relief and do not address the underlying degenerative process. Moreover, long-term use of NSAIDs is associated with gastrointestinal, renal, and cardiovascular side effects, limiting their prolonged use.^{3,4}

In recent years, regenerative therapies have gained attention as potential disease-modifying treatments for OA. Among these, PRP has emerged as a promising biological therapy due to its autologous origin and high concentration of growth factors.⁵ PRP is prepared by centrifugation of whole blood, resulting in a plasma fraction enriched with platelets that release various

bioactive molecules such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF- β), and vascular endothelial growth factor (VEGF), which play a key role in tissue healing and regeneration.⁶

The intra-articular administration of PRP is believed to promote cartilage repair, reduce inflammation, and improve joint lubrication, thereby alleviating pain and improving function in patients with knee OA.⁷ Several clinical studies have demonstrated that PRP injections can significantly reduce pain and improve functional outcomes as measured by validated scoring systems such as VAS, WOMAC score, and KSS.⁸

Additionally, PRP therapy is considered safe with minimal adverse effects due to its autologous nature, making it an attractive alternative to conventional therapies. It has also shown effectiveness across different stages of OA, although its efficacy may vary depending on disease severity.⁹

Despite encouraging results, there is still variability in outcomes due to differences in preparation techniques, dosing, and patient selection. Therefore, further studies are required to evaluate the effectiveness of PRP injections across all stages of knee OA using standardized outcome measures.¹⁰

Hence, present study was undertaken to evaluate results of intra-articular PRP injections in patients with knee OA across different stages, with emphasis on pain relief and functional improvement over follow-up period of 6 months.

Hence, the present study was undertaken as a case series to evaluate the clinical outcomes of intra-articular PRP injections in patients with knee OA across different stages. A case series is an observational descriptive study design that involves a group of patients receiving a similar intervention without a comparison group, primarily aimed at assessing treatment outcomes and generating clinical evidence. In this study, patients presenting with knee OA treated with PRP injections and followed prospectively over a period of 6 months. Outcomes were assessed in terms of pain relief and functional improvement using validated scoring systems such as VAS, WOMAC score, and KSS at predefined intervals. This design allows for real-world evaluation of effectiveness of PRP therapy and provides preliminary evidence regarding its role in managing OA across varying severities.

CASE SERIES

This study was conducted as a prospective case series in the Department of Orthopaedics at a tertiary care centre over a specified study period. A total of 10 patients presenting with knee OA and fulfilling the inclusion criteria were included in the study. The diagnosis of OA was based on clinical evaluation and radiological findings. Written informed consent was obtained from all patients

after explaining the procedure, benefits, and possible complications.

Patients with symptomatic knee OA across different stages were included, while those with active infection, inflammatory arthritis, coagulopathy, recent intra-articular steroid injection, or severe systemic illness were excluded. A detailed history and clinical examination were performed, and baseline pain and functional status were assessed using VAS, WOMAC score, and KSS.

The procedure was performed under strict aseptic precautions. Patients were placed in the supine position, and the affected knee was prepared and draped. Approximately 4-5 ml of PRP was prepared from the patient's own blood by centrifugation at 2200 rpm for 8 minutes. The PRP was injected intra-articularly into the knee joint using an inferolateral approach with a 16-gauge needle. After injection, passive flexion and extension of the knee joint were performed to ensure uniform distribution of PRP. Local anaesthetics were not used to avoid interference with platelet activation.

Following the procedure, a sterile dressing was applied, and patients were observed for immediate complications such as pain, swelling, allergic reactions, or hemodynamic instability. Patients were monitored for a short duration post-procedure and discharged on the same day. Oral paracetamol was prescribed for pain relief, while non-steroidal anti-inflammatory drugs were avoided as they may interfere with platelet activity. Patients were allowed to resume weight-bearing as tolerated.

Follow-up assessments were conducted at 48 hours, 1 month, 3 months, and 6 months after injection. Outcome measures included pain relief and functional improvement assessed using VAS, WOMAC, and KSS. All data were recorded systematically and analysed descriptively to evaluate effectiveness of PRP injections in knee OA.

In this case series comprising 10 patients with knee OA, a progressive and clinically meaningful improvement in pain and functional outcomes was observed following intra-articular PRP injection. The mean baseline VAS score among all patients was 7.5 ± 1.1 , indicating moderate to severe pain at presentation. Following PRP administration, a gradual reduction in pain was noted at each follow-up interval. At 48 hours, there was minimal change in pain scores; however, by the end of 1 month, a noticeable reduction was observed. This improvement became more pronounced at 3 months and was sustained at 6 months, where the mean VAS score reduced to 3.4 ± 1.3 , reflecting a substantial decrease in pain intensity.

When analyzed stage-wise, patients with Stage II OA demonstrated the greatest improvement, with VAS scores reducing from an average of 6-7 at baseline to 2-3 at 6 months. Patients with stage III disease showed moderate improvement, with scores decreasing from 8 to around 3-4, while those with stage IV OA exhibited relatively lesser

improvement, with VAS scores reducing from 9 to 5-6, indicating that disease severity influences the magnitude of response to PRP therapy.

Functional outcomes also showed significant improvement over time. The mean WOMAC score, which assesses pain, stiffness, and physical function, demonstrated a consistent downward trend, indicating reduction in symptoms and improvement in daily activities. Similarly, the KSS showed progressive improvement from baseline to 6 months, reflecting enhanced joint function, increased range of motion, and improved mobility among patients.

Overall, 8 out of 10 patients (80%) showed marked clinical improvement, while the remaining 2 patients (20%), primarily those with advanced OA, demonstrated moderate improvement. None of the patients reported worsening of symptoms during the follow-up period.

No major adverse effects or complications such as infection, allergic reactions, or joint instability were observed. Mild transient pain at the injection site was reported in a few cases, which resolved spontaneously.

These findings indicate that PRP therapy provides sustained pain relief and functional improvement in patients with knee OA, with better outcomes observed in early to moderate stages of the disease.

Table 1: VAS score trend over time.

Time interval	Mean VAS±SD
Baseline	7.5±1.1
48 hours	7.2±1.0
1 month	5.6±1.2
3 months	4.2±1.3
6 months	3.4±1.3

Table 2: Clinical outcome at 6 months.

Outcome category	N	Percentage (%)
Significant improvement	6	60
Moderate improvement	2	20
Mild improvement	2	20
No improvement	0	0

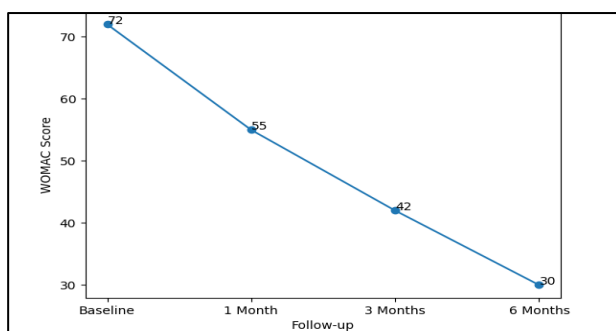


Figure 1: WOMAC score trend.

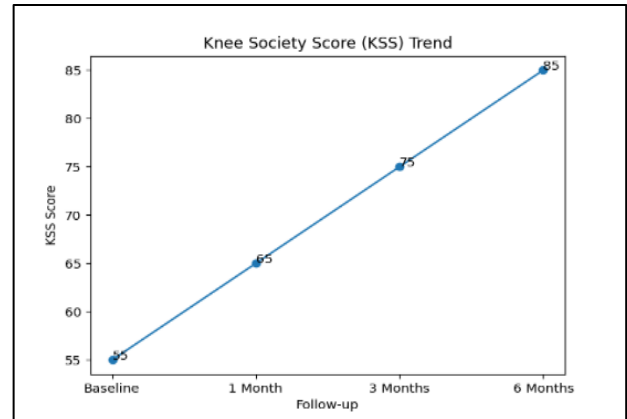


Figure 2: KSS trend.



Figure 3: Marking the knee joint.

*The image depicts a medical procedure involving intra-articular injection into the knee joint, with marked anatomical landmarks guiding needle placement. It suggests a therapeutic or diagnosis intervention, such as corticosteroid injection or joint aspiration.



Figure 2 (a and b): Post injection mobility.

*The images demonstrate clinical manipulation of a patient's knee and hip, likely assessing the range of motion or performing an orthopaedic examination. Both images emphasize the angles achieved during flexion and extension of the lower limb.

DISCUSSION

The present case series evaluated the effectiveness of intra-articular PRP injections in patients with knee OA across different radiological stages. The findings demonstrated a progressive reduction in pain and significant improvement in functional outcomes over a follow-up period of six months, indicating that PRP is an effective non-surgical treatment modality, particularly in early and moderate stages of knee OA.

In the present study, the mean VAS score decreased significantly from 7.5 ± 1.1 at baseline to 3.4 ± 1.3 at 6 months, representing an approximate 55% reduction in pain intensity. Filardo et al evaluated 91 patients with degenerative cartilage lesions and early OA who received three intra-articular PRP injections. They reported a significant reduction in mean VAS scores from approximately 7.2 at baseline to 3.8 at 6 months, with maximum improvement observed during the first six months of follow-up.¹¹ Similarly, Patel et al in a randomized controlled trial involving 78 patients, reported that patients treated with PRP demonstrated significantly lower VAS scores than the placebo group, with pain scores improving from approximately 7.4 to 3.5 after six months ($p < 0.001$).¹² The magnitude of pain reduction observed in the present study is therefore comparable to these previously published findings.

Functional assessment using the WOMAC and KSS also demonstrated progressive improvement throughout the study period. The WOMAC score showed a consistent decline, indicating improvement in pain, stiffness, and physical function, whereas the KSS demonstrated continuous improvement in knee function and mobility. Kon et al studied 100 patients with knee OA treated with PRP and observed significant improvement in WOMAC scores, with mean scores improving by nearly 40-45% during 12 months of follow-up.¹³ Likewise, Campbell et al in a systematic review including 14 clinical studies, concluded that PRP consistently improved WOMAC, IKDC, and functional outcome scores compared with baseline and, in several studies, demonstrated superior functional recovery compared with hyaluronic acid injections.¹⁴ The present study showed a similar trend of sustained functional improvement following PRP therapy.

An important observation in the present study was the stage-dependent response to PRP treatment. Patients with stage II OA demonstrated the greatest clinical improvement, followed by stage III, whereas stage IV patients showed only moderate improvement. Similar findings were reported by Khoshbin et al whose systematic review concluded that PRP therapy provides greater clinical benefit in patients with early to moderate OA (Kellgren-Lawrence grades I-III) compared with advanced disease, owing to the greater regenerative potential of less severely damaged cartilage.¹⁵ Laudy et al also reported that PRP showed superior clinical outcomes in patients with mild and moderate OA, whereas the response in advanced

OA was comparatively limited.¹⁶ The findings of the present study are therefore consistent with existing evidence emphasizing the importance of early intervention.

The favorable clinical outcomes observed in this study may be explained by the biological properties of PRP. PRP contains a high concentration of biologically active growth factors, including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF- β), vascular endothelial growth factor (VEGF), insulin-like growth factor (IGF), and epidermal growth factor (EGF), which promote tissue regeneration, enhance cartilage metabolism, suppress inflammatory mediators, and facilitate repair of damaged tissues. Foster et al comprehensively reviewed the biological mechanisms of PRP and concluded that these growth factors contribute to improved cartilage healing, modulation of inflammation, and symptomatic relief in degenerative joint diseases.¹⁷ These biological effects provide a plausible explanation for the sustained improvement in pain and function observed in the present study.

The overall clinical response in the present study was encouraging, with 80% of patients demonstrating significant clinical improvement and the remaining 20% showing moderate improvement, while none experienced worsening of symptoms. Dai et al in a meta-analysis including 14 randomized controlled trials involving more than 1,400 patients, concluded that PRP significantly improved pain relief and functional outcomes compared with placebo and hyaluronic acid, particularly at 6- and 12-month follow-up, with overall patient satisfaction rates exceeding 75-80% in most studies.¹⁸ The proportion of patients demonstrating meaningful improvement in the present study closely resembles these published findings.

Another important observation was the excellent safety profile of PRP therapy. No major complications were encountered during the study period, and only mild transient pain at the injection site was observed in a few patients, which resolved spontaneously without intervention. Similar safety outcomes have been consistently reported by Laudy et al who found no increase in serious adverse events following PRP injections.¹⁶ Likewise, Dai et al concluded that PRP is a safe treatment modality because it is prepared from autologous blood, thereby minimizing the risk of immunological reactions, disease transmission, or major complications.¹⁸

Overall, the findings of the present case series are consistent with the current literature supporting the use of PRP as an effective, safe, and promising biological treatment for knee OA. The study further reinforces that patients with early and moderate stages of OA derive the greatest clinical benefit from PRP therapy. Although the present study included a relatively small number of patients, the observed improvements in pain, function, and patient outcomes closely parallel those reported in larger randomized trials and systematic reviews, thereby

supporting the growing evidence favoring PRP as an important joint-preserving treatment option for knee OA.

Limitations

The primary limitation of this study is the small sample size (n=10), which restricts the generalizability of the findings. Being a case series, there was no control or comparison group, limiting the ability to establish causality. The study design was descriptive and non-randomized, and therefore subject to selection and observational bias. The follow-up period was limited to six months, and long-term outcomes such as disease progression and need for surgical intervention were not evaluated. Additionally, variability in individual response to PRP and lack of standardization in PRP preparation may influence the results.

CONCLUSION

This case series demonstrates that intra-articular PRP injection is an effective and safe modality for the management of knee OA. A substantial reduction in pain was observed, with mean VAS scores improving from 7.5 ± 1.1 at baseline to 3.4 ± 1.3 at 6 months, along with consistent improvement in functional outcomes as reflected by WOMAC and KSSs. The majority of patients (80%) showed significant clinical improvement, while the remaining (20%) experienced moderate benefit. The response was more pronounced in early to moderate stages (Stage II and III) compared to advanced disease (Stage IV). No major adverse effects were noted, highlighting the safety of PRP therapy. Overall, PRP appears to be a promising non-surgical treatment option for knee OA, particularly in earlier stages of the disease.

Recommendations

Further research in the form of large-scale randomized controlled trials (RCTs) is recommended to validate the efficacy of PRP and establish stronger evidence. Studies with larger sample sizes and longer follow-up periods are needed to assess sustained benefits and long-term outcomes. Standardization of PRP preparation techniques, dosing, and frequency of injections should be explored to optimize treatment protocols. Comparative studies evaluating PRP against other modalities such as hyaluronic acid or corticosteroids would provide better clinical guidance. PRP therapy may be considered particularly in early-stage OA to delay disease progression and reduce the need for surgical intervention.

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