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RESEARCH ARTICLE
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CLINICAL OUTCOME OF PLATELET–RICH PLASMA (PRP) INJECTIONS IN EARLY KNEE OSTEOARTHRITIS

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ABSTRACT

Background: Knee osteoarthritis is a common degenerative joint disease that significantly affects quality of life. In recent years, Platelet–Rich Plasma (PRP) has gained attention as a potential biological therapy for managing early stages of osteoarthritis.

Aim: The aim of this study was to evaluate the clinical outcomes of PRP intra-articular injections in patients with grade I and II knee osteoarthritis.

Methods: This retrospective study included patients diagnosed with early knee osteoarthritis who received three intra-articular PRP injections administered one month apart. Clinical evaluation was performed before treatment and subsequently at 3, 6, and 9 months of follow-up. Pain, stiffness, and functional outcomes were assessed using the Visual Analog Scale (VAS) and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores.

Results: Significant improvement was observed in both VAS and WOMAC scores at all follow-up intervals compared to baseline. Patients reported a reduction in pain and stiffness, along with improved functional mobility. The most notable improvements were seen within the first six months, with sustained benefits observed up to nine months. No major adverse effects related to PRP injections were reported during the follow-up period.

Conclusion: PRP intra-articular injections provide an effective short-term treatment for patients with grade I and II knee osteoarthritis. The therapy significantly alleviates pain, reduces stiffness, and enhances joint function, making it a safe and beneficial intervention for early-stage disease. However, further prospective studies with larger sample sizes and longer follow-up periods are warranted to validate long-term efficacy.

Keywords: Platelet rich Plasma (PRP), Intra-articulartreatment, Knee osteoarthritis

INTRODUCTION

Knee osteoarthritis (OA) is one of the most prevalent musculoskeletal disorders worldwide and a major cause of pain and disability[1]. It is a degenerative joint disease characterized by the progressive loss of articular cartilage, synovial inflammation, and changes in subchondral bone. Clinically, patients experience pain, stiffness, swelling, and limitation of movement, which worsen over time if

untreated[2]. The global burden of knee OA is rising, particularly due to aging populations, sedentary lifestyles, and increasing rates of obesity. In developing countries, including Pakistan, the condition poses a significant health challenge, limiting mobility, reducing quality of life, and increasing economic dependency[3].

Conventional treatment strategies for knee OA include lifestyle modification, weight management, physiotherapy, analgesics, and non-steroidal anti-inflammatory drugs (NSAIDs). Intra-articular corticosteroid or hyaluronic acid injections are also commonly used for symptom relief. However, these therapies have limitations[4]. NSAIDs are associated with gastrointestinal and cardiovascular side effects, while corticosteroids provide only short-term benefit and may accelerate cartilage degeneration with repeated use. Surgical options, such as total knee replacement, are generally reserved for advanced disease but are invasive, costly, and not suitable for younger patients with early OA. These limitations have driven interest in regenerative and biological therapies that aim not only to relieve symptoms but also to support tissue repair and slow disease progression[5].

Platelet–Rich Plasma (PRP) therapy has emerged as one of the most promising biological treatments for early knee OA. PRP is an autologous preparation derived from the patient's own blood, enriched with a high concentration of platelets suspended in plasma[6]. Platelets are rich in growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), and insulin-like growth factor (IGF). These bioactive molecules play a crucial role in promoting cell proliferation, angiogenesis, and matrix synthesis, thereby contributing to tissue repair and regeneration. When injected intra-articularly, PRP is thought to create a favorable environment for cartilage healing, reduce inflammation, and enhance joint lubrication[7].

Several clinical studies have demonstrated the benefits of PRP in knee OA. Compared to corticosteroids and hyaluronic acid, PRP has been shown to provide greater and more sustained improvement in pain relief and functional outcomes, particularly in patients with mild-to-moderate OA (grades I and II). Improvements are often measured using standardized scoring systems such as the Visual Analog Scale (VAS) for pain and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) for stiffness and function. Evidence suggests that early intervention with PRP may delay disease progression, reduce the need for surgical treatment, and improve quality of life[8].

Despite growing international evidence, data from local populations remain limited. Variations in lifestyle, genetic background, and healthcare access may influence outcomes, making region-specific research essential. This study was conducted to evaluate the clinical outcomes of PRP intra-articular injections in patients with grade I and II knee OA, using VAS and WOMAC scores over a 9-month follow-up period. The findings aim to contribute to evidence-based practice and support the role of PRP as a safe, minimally invasive, and effective short-term treatment for early knee osteoarthritis.

MATERIAL AND METHODS

A retrospective study from February 2019 toMarch 2020 including 88 knees of 58 patients who presented with the complain ofunilateral or bilateral knee pain, knee joint stiffness and limitation in routine activities of daily living were evaluated clinically and radiographically, all the radiographs reviewed by single reader and patients were classified as early osteoarthritis (OA) of knee joint according to the kellgren lawrence criteria[3]. Patients with moderate and advance knee osteoarthritis and other diseases such as rheumatoid arthritis (RA), gout, ankylosing spondylitis (AS), infectious joint disease, radiculopathy from spinal disease, acute knee joint injury were excluded.

All procedures were performed in out patient department, After aseptic measures, 3 ml of Platelet rich plasma injected anteriolaterally in 5cc syringe, Three intraarticular knee injections of platelet richplasma (PRP) were injected each one monthapart. After procedure patients were sent home with post procedure care as: NSAIDs for pain relief for two weeks, routine activities of daily living, Quadracip and hamstrings strengthening exercises. All other modalities for treatment of early knee OA were advised to hold. All patients were followed up on 3, 6 and 9months and the clinical outcome was measure by visual analog score (VAS) and Western Ontario and McMaster UniversitiesArthritis

Index (WOMAC) score for pain, stiffness, and range of motion[4,5,9]. Significant improvement was recorded on 3,6 and 9 months follow up visits and after 9 months follow up.

RESULTS

A total of 58 patients with early knee osteoarthritis were included in this study. The mean age of the participants was 51.76 years (±6.99)**,** indicating that the majority of patients were in their fifth to sixth decade of life. This reflects the typical age group in which degenerative joint changes become clinically evident, particularly in weight-bearing joints such as the knee.

With respect to gender distribution, the majority of the study population were female (36 patients; 62.1%)**,** while male patients accounted for 22 cases (37.9%) (Table-1)**.** This finding is consistent with the higher prevalence of osteoarthritis among women, particularly after the age of 50, which has been attributed to hormonal changes following menopause, reduced bone mineral density, and biomechanical factors.

When analyzing the severity of disease at presentation, 18 patients (31%) were diagnosed with stage I osteoarthritis, while 40 patients (69%) were classified as stage II (Table-1)**.** This shows that most patients presented with moderate early-stage disease rather than very mild forms, possibly due to delayed healthcare-seeking behavior or underestimation of early symptoms. The predominance of stage II patients also highlights the need for effective treatment strategies that can prevent further progression.

Regarding the laterality of disease, 28 patients (48.3%) demonstrated unilateral knee involvement**,** whereas 30 patients (51.7%) had bilateral involvement (Table-1)**.** This near-equal distribution suggests that while osteoarthritis may begin in one knee, disease progression often involves both joints over time, likely due to shared mechanical load and degenerative processes. Bilateral involvement is clinically significant as it may further impair mobility, independence, and overall quality of life.

Taken together, these baseline characteristics reflect a population that is representative of typical early knee osteoarthritis patients: predominantly middle-aged females, more frequently affected by stage II disease, and with bilateral knee involvement in nearly half of the cases. These demographic and clinical features provide important context for interpreting the outcomes of Platelet–Rich Plasma (PRP) therapy in this study, as they highlight the common risk factors and clinical presentation patterns of patients in our setting.

Table -1: Demonstrates demographiccharacteristics of patients.

	N (%)
Gender Female Male	 36 (62.1%) 22 (37.9%)
Age	51.76 (±SD 6.992)
Stage Stage 1 Stage 2	 18 (31%) 40 (69%)
Knee involved Unilateral Bilateral	 28 (48.3%) 30 (51.7%)

All patients were evaluated pre procedure with mean VAS score of 6.22+ SD 0.859. At 3 month follow up mean VAS score 4.52+SD 0.995, at 6 month follow up mean VASscore 3.69+SD 1.231 and 9 month follow upmean VAS score 2.72 +SD1.295. Fig 1 Mean WOMAC score pretreatment was 37.84 which improved to 35.37, 34.04 and 33.22 at 3, 6 and 9 month follow up respectively (Figure-1).

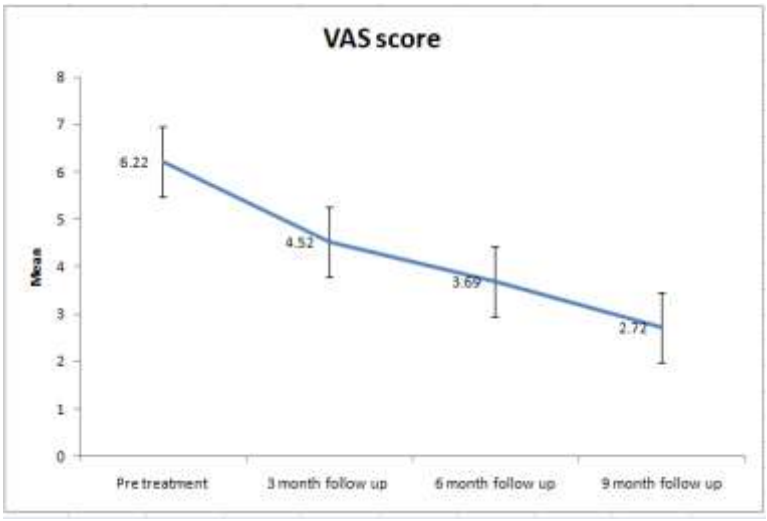

Figure-1: Pre treatment, 3rd, 6th and 9thmonth follow up VAS score.

Table 2 presents the changes in Visual Analog Scale (VAS) scores from pre-treatment to the 9-month follow-up. The mean pre-treatment VAS score was 6.22 ± 0.859, indicating a high level of baseline pain. At the 3-month follow-up, the mean VAS score decreased to 4.52 ± 0.995, showing a statistically significant improvement ($p < 0.01$). Further reduction was observed at the 6-month follow-up**,** where the mean score declined to 3.69 ± 1.231 ($p < 0.01$). By the 9-month follow-up, the mean score had dropped markedly to 2.72 ± 1.295, which also reached statistical significance ($p < 0.01$). These results demonstrate a consistent and progressive decline in pain intensity over time, confirming the effectiveness of the treatment in providing long-term pain relief.

Table-2: Demonstrates Pre treatment, 3rd, 6th and 9th follow up VAS and WOMAC score.

	Mean +SD	P value
VAS score		
Pre treatment	6.22 (±0.859)	
3 month follow	4.52 (±0.995)	<0.01*
up	3.69 (±1.231)	<0.01*
	2.72 (±1.295)	<0.01*

Figure 2 illustrates the trend in WOMAC scores from pre-treatment through the 9-month follow-up period. At baseline (pre-treatment)**,** patients demonstrated relatively high WOMAC scores, indicating considerable pain, stiffness, and functional limitation. By the 3-month follow-up, there was a marked reduction in the mean WOMAC score, reflecting an early improvement in clinical symptoms. This improvement continued at the 6-month follow-up, where scores further decreased, showing sustained effectiveness of the treatment. At the **9**-month follow-up, the WOMAC score declined even more, reaching its lowest level, which signifies a substantial enhancement in joint function and reduction of disability. Overall, the figure demonstrates a consistent downward trend in WOMAC scores across all follow-up periods, confirming progressive and statistically significant improvement in patients' symptoms and functional outcomes over time.

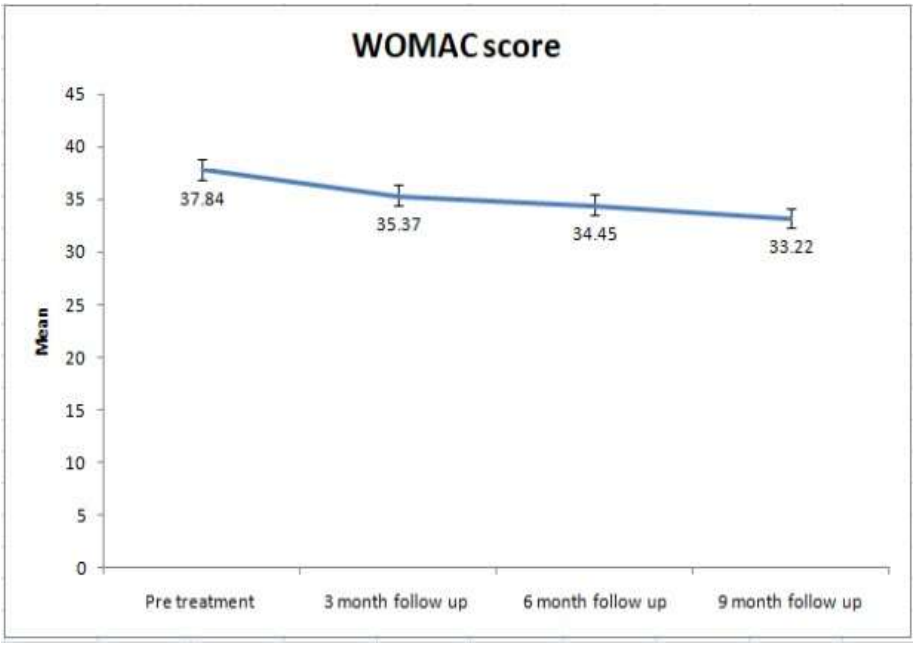

Figure-2: Pre treatment, 3rd, 6th and 9thmonth follow up WOMAC score.

DISCUSSION

This study evaluated the clinical outcomes of intra-articular Platelet–Rich Plasma (PRP) injections in patients with early knee osteoarthritis (OA), specifically grades I and II[9]. The findings demonstrated that PRP significantly improved pain and functional outcomes as assessed by VAS and WOMAC scores over a 9-month follow-up period. These results reinforce the growing evidence that PRP therapy is a safe and effective short-term treatment for patients with early OA[10].

Our findings are consistent with earlier reports demonstrating the beneficial role of PRP in knee OA. Several randomized controlled trials have shown that PRP provides superior improvement in pain and function compared to intra-articular corticosteroids and hyaluronic acid, particularly in patients with mild-to-moderate OA. For example, Kilincoglu et al (2015). reported that PRP injections resulted in significant reductions in VAS scores at 6 months compared with placebo. Similarly, Meta-analyses have confirmed that PRP leads to sustained improvement for up to 12 months in patients with early disease.

The progressive decline in VAS scores from 6.22 at baseline to 2.72 at 9 months in our cohort mirrors these findings, suggesting that PRP provides both early and sustained pain relief. WOMAC scores also showed continuous improvement, indicating that PRP not only reduces pain but also enhances joint function and reduces stiffness.

The clinical benefits observed can be attributed to the biological properties of PRP. Platelets release multiple growth factors, such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), and insulin-like growth factor (IGF), which stimulate chondrocyte proliferation, enhance extracellular matrix synthesis, and suppress inflammatory mediators. These effects may improve the intra-articular environment by promoting cartilage healing, reducing synovial inflammation, and slowing degenerative changes. This biological basis explains why PRP is more effective in early-stage disease, where cartilage is still partially preserved and capable of repair[11,12].

The majority of our patients were women (62.1%), which reflects the well-documented higher prevalence of OA in females. Hormonal changes after menopause, reduced bone mineral density, and altered joint biomechanics may explain this predisposition. The mean age of participants was 51.7 years, aligning with the age group in which degenerative joint changes become clinically symptomatic. The predominance of stage II OA in our study also reflects a common trend in which patients seek medical attention once symptoms become more persistent and functionally limiting[13].

The consistent and statistically significant improvements in both VAS and WOMAC scores highlight the clinical utility of PRP injections as a minimally invasive, safe, and cost-effective intervention for

early OA. Importantly, PRP may delay the need for surgical intervention, such as total knee replacement, which is not only invasive but also associated with high costs and potential complications. By offering symptomatic relief and functional improvement, PRP may allow patients to maintain mobility and quality of life during the early stages of disease[14,15,16].

This study has certain limitations. First, it was retrospective in nature, which may introduce selection bias. Second, the sample size was relatively small, and the follow-up duration was limited to 9 months; therefore, the long-term efficacy of PRP could not be assessed. Third, variability in PRP preparation techniques and injection protocols remains a challenge in standardizing outcomes across different studies. Future research should focus on larger, prospective, randomized controlled trials with longer follow-up periods to confirm the durability of PRP benefits and to establish standardized preparation and administration protocols.

Emerging evidence suggests that combining PRP with other biological treatments, such as stem cell therapy or hyaluronic acid, may yield even greater benefits. Furthermore, serial injections and individualized treatment schedules tailored to disease stage may optimize outcomes. Future investigations should also consider cost-effectiveness analyses, as affordability is an important factor in resource-limited settings.

CONCLUSION

Even with widely accepted therapy with analgesics and anti inflammatory, intra articular hyloronic acid, Glucosamine, Chondroitin-sulfate, intra-articular injectionof steroids, in patients with early knee osteoarthritis, PRP intra articular injectionsin early knee osteoarthritis showed effectiveshort term clinical outcome in respect to alleviating pain, stiffness and improving function.

DISCLOSURE OF CONFLICT OF INTEREST

No financial interest, arrangement or affiliation that would constitute a conflict ofinterest.

REFERENCES

1. Kilincoglu V, Yeter A, Servet E, Kangal M, Yildirim M. Short term results comparison of intraarticular platelet-rich plasma (prp) and hyaluronic acid (ha) applications in early stage of knee osteoarthritis. International Journal of Clinical and Experimental Medicine. 2015;8(10):18807.
2. Jang SJ, Kim JD, Cha SS. Platelet-rich plasma (PRP) injections as an effective treatment for early osteoarthritis. European Journal of Orthopaedic Surgery & Traumatology. 2013 Jul 1;23(5):573-80.
3. Kellgren JH, Lawrence JS. Radiological assessment of osteo-arthrosis. Annals of the rheumatic diseases. 1957 Dec;16(4):494.
4. Huang PH, Wang CJ, Chou WY, Wang JW, Ko JY. Short-term clinical results of intra-articular PRPinjections for early osteoarthritis of the knee. International Journal of Surgery. 2017 Jun 1;42:117-22.
5. McConnell S, Kolopack P, Davis AM. The Western Ontario and McMaster Universities OsteoarthritisIndex (WOMAC): a review of its utility and measurement properties. Arthritis Care & Research: Official Journal of the American College of Rheumatology. 2001 Oct;45(5):453-61.
6. Martini LI, Via AG, Fossati C, Randelli F, Randelli P, Cucchi D. Single platelet-rich plasma injection for early stage of osteoarthritis of theknee. Joints. 2017 Mar;5(1):2.
7. Dhillon MS, Patel S, John R. PRP inOA knee–update, current confusionsand future options. Sicot-j. 2017;3.
8. Hassan AS, El-Shafey AM, AhmedHS, Hamed MS. Effectiveness of theintra-articular injection of platelet rich plasma in the treatment of patients with primary knee osteoarthritis. The Egyptian Rheumatologist. 2015 Jul 1;37(3):119-24.
9. Waterfield J, Sim J. Clinical assessment of pain by the visual analogue scale. British Journal of Therapy and Rehabilitation. 1996Feb;3(2):94-7

10. Emerging and New Treatment Options for Knee Osteoarthritis Curr Rheumatol Rev 2022;18(1):20-32. doi: 10.2174/1573397117666211111 111738.
11. Comparison between intra-articular infiltrations of placebo, steroids, hyaluronic and PRP for knee osteoarthritis: a Bayesian network meta-analysis. Arch Orthop Trauma Surg 2021 Sep;141(9):1473-1490. doi: 10.1007/s00402-020-03551-y. Epub 2020 Jul 28.
12. The Effect of Platelet-Rich Plasma on the Intra-Articular Microenvironment in Knee Osteoarthritis Int J Mol Sci. 2021 May 23;22(11):5492. doi: 10.3390/ijms22115492.
13. Intra-Articular Injections in Knee Osteoarthritis: A Review of Literature J Funct Morphol Kinesiol. 2021 Feb 3;6(1):15. doi: 10.3390/jfmk6010015.
14. Injection-Based Management of Osteoarthritis of the Knee: A Systematic Review of Guidelines Front Pharmacol. 2021 Apr 20;12:661805. doi: 10.3389/fphar.2021.661805. eCollection 2021.
15. Improvising PRP for use in osteoarthritis knee- upcoming trends and futuristic view J Clin Orthop Trauma . 2019 Jan-Feb;10(1):32-35. doi: 10.1016/j.jcot.2018.10.005. Epub 2018 Oct 16.
16. The use of PRP injections in the management of knee osteoarthritis Cell Tissue Res. 2019 May;376(2):143-152. doi: 10.1007/s00441-019-02996-x. Epub 2019 Feb 13.