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Research Article

Short-Term Outcomes of Intra-Articular Platelet-Rich Plasma Injection in Knee Osteoarthritis Patients: A Retrospective Study from Jordan

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Abstract

Background: Knee osteoarthritis (KOA) is a major cause of disability worldwide, with increasing prevalence among aging populations. In regions such as the Middle East, where access to surgical interventions is limited, non-surgical treatment options like injection of intra-articular platelet-rich plasma (IA-PRP) are gaining increased clinical attention. However, evidence from Jordan regarding the effectiveness of this treatment remains scarce. **Objective:** Evaluate the short-term clinical and psychological outcomes of IA-PRP injection in Jordanian patients with radiographically confirmed KOA. **Methods:** A retrospective cohort study was conducted at the Jordanian Royal Medical Services between June 2024 and June 2025. Patients with Kellgren–Lawrence Grades 2–4 KOA who had received their first dose of IA-PRP injection were included. Individuals using NSAIDs, opioids, or other analgesics during the study period were excluded. Outcomes were assessed before and three weeks after injection using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and the Patient Health Questionnaire-9 (PHQ-9). Statistical analysis was performed using the Wilcoxon signed-rank test and multivariate analysis of variance, with significance set at $p<0.05$. Results: A total of 130 patients were included (mean age 64.2 ± 11.7 years; 53.8% female; mean BMI 30.5 ± 4.1 kg/m²). Significant improvements were observed across all WOMAC subscales and PHQ-9 scores at three weeks post-injection ($p<0.001$ for all). The median WOMAC pain score improved from 7 to 3, stiffness from 1 to 0, functional capacity from 17 to 8, total score from 24 to 11, and PHQ-9 from 4 to 1. After adjusting for age, BMI, and baseline differences, patients with Grades 2 and 3 KOA were observed to show greater improvements than those with Grade 4. **Conclusion:** IA-PRP was associated with significant short-term improvements in pain, stiffness, functional capacity, and psychological well-being among patients with KOA, particularly in those with mild to moderate disease severity. These findings suggest that PRP can be used as a valuable non-surgical treatment modality for KOA, especially in settings where access to surgical care is limited.

Keywords: Intra-articular; Knee osteoarthritis; Platelet-rich plasma; WOMAC; PQH-9

Introduction

Osteoarthritis (OA) is the most common form of arthritis and the leading cause of lower extremity disability among older adults [1]. It is associated with progressive joint degeneration and the inflammation of synovial spaces [2]. The prevalence of OA increases with advancing age and higher Body Mass Index (BMI) [3]. Approximately 12.1% of the US population between the ages of 25 and 74 has OA in one or more joints [4]. Recent data estimate that the prevalence of OA in the Middle East and North Africa is 24,604,611 (95% UI: 22,080,960–27,327,135), with 399,351 cases in Jordan (95% UI: 357,424-447,816); higher rates are observed among females, with knee OA accounting for the majority of cases [5].

OA causes a substantial loss of mobility and independence, contributing significantly to increased years lived with disability. The limitations resulting from OA impose a considerable economic burden on both patients and healthcare systems due to the need for ongoing management, including pharmacological therapy, physical rehabilitation, and, in advanced cases, joint replacement surgery. In this regard, Jordan—among other countries—experiences a higher-than-expected burden [5]. Since surgical intervention remains limited by accessibility and cost in many regions, and there is no definitive cure or proven structure-modifying interventions for OA, early diagnosis and effective non-surgical interventions are essential for managing OA and improving patients' quality of life [5,6].

Many therapeutic agents, such as Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), opioids, and Intra-Articular (IA) injections (including platelet-rich plasma, corticosteroids, and hyaluronic acid), are used to manage OA. Due to contraindications or the risk of addiction, NSAIDs and opioids are not prescribed for all patients or for chronic use [7]. Patients who receive platelet-rich plasma (PRP) injections are typically advised to discontinue NSAIDs during the treatment period. Previous studies, including one conducted by Schippinger et al., highlight the negative impact of NSAIDs on platelet function in individuals receiving PRP injections [8].

Non-pharmacological approaches such as exercise, lifestyle modification, and weight loss have been investigated, with some being strongly suggested as core interventions for managing OA; however, they are often not implemented in clinical practice. If conservative management fails and joint symptoms substantially impact patients' quality of life, they are referred for surgical options [9].

PRP is a biological product derived from autologous blood obtained after centrifugation, which contains a higher-than-baseline concentration of platelets suspended in a portion of the plasma fraction [10]. Platelets serve as a natural reservoir of growth factors, including platelet-derived growth factor, vascular endothelial growth factor, epidermal growth factor, platelet-derived angiogenesis factor, insulin-like growth factor-1, platelet factor 4, platelet-derived angiogenic factor, and Transforming Growth Factor-beta (TGF-β) [10].

The average platelet count in healthy individuals' blood is approximately 200,000/µl. Scientific evidence has demonstrated that platelet concentrations of approximately 1,000,000 platelets/µl can enhance bone and soft tissue healing. Therefore, this concentration within a 5-ml volume of plasma is now considered the practical working definition of PRP [11]. Intra-articular platelet-rich plasma (IA-PRP) injection has been shown to be beneficial for both early and advanced stages of knee osteoarthritis (KOA) [12-14]. A single injection of PRP is reported to be as effective as two injections in early KOA [12]. When compared to corticosteroid and hyaluronic acid injections, IA-PRP injection has been reported to produce superior outcomes for the management of KOA [15-17].

Aim

This retrospective study aims to evaluate the short-term effects of a single IA-PRP injection in patients with KOA. Despite growing international evidence regarding the potential benefits of PRP, findings across studies remain inconsistent, and data from Jordan are limited. The Jordanian population was chosen as a representative cohort of the Middle East, where such research is scarce. Clinical and psychological outcomes were evaluated three weeks post-injection using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Patient Health Questionnaire-9 (PHQ-9).

Methods

Study Design and Ethical Approval

This retrospective cohort study was conducted after obtaining approval from the Royal Medical Services Human Research Ethics Committee. The electronic medical database of the institution was reviewed to identify patients diagnosed with KOA who received their first IA-PRP injections between June 2024 and June 2025.

Patient Selection

Radiographic classification of KOA severity was done based on the Kellgren-Lawrence (K&L) grading system. Those with a K&L Grade of 2, 3, or 4 were included in the study, corresponding to mild, moderate, and severe KOA, respectively.

Patients with Grade 1 KOA were excluded because most of them declined the IA-PRP injection, preferring conservative pharmacological (NSAIDs or opioids) or non-pharmacological management. To minimize confounding, only patients who did not use NSAIDs, opioids, or any other medications apart from paracetamol during the study period were included, as these drugs may interfere with the healing process, pain assessment, and evaluation of treatment outcomes.

Eligible participants were required to complete both pre- and post-injection assessments, receive a single ultrasound-guided IA-PRP injection, and have no prior IA injections.

PRP Preparation and Injection Procedure

PRP was prepared from each patient's autologous blood sample on the day of the procedure. The resulting PRP contained a platelet concentration at least five times higher than the patient's baseline value. All injections were administered under ultrasound guidance by an experienced anaesthesiologist to ensure accurate IA delivery.

Outcome Measures

Patient outcomes were assessed before treatment and three weeks after IA-PRP injection using validated tools. The WOMAC questionnaire was used to evaluate the key outcomes of KOA. WOMAC is a standardized tool used to assess three main complications associated with KOA: pain (maximum score = 20), stiffness (maximum score = 8), and physical functions (maximum score = 68). The results of these three categories are summed to give a total WOMAC score out of 96. The WOMAC questionnaire is a copyrighted instrument; therefore, no individual items or questions are reproduced in this manuscript, and only aggregated subscale and total scores were analyzed [18]. PHQ-9 was used to assess psychological and depressive symptoms [19,20].

Patients' data were collected only once—at the end of the third week following IA-PRP injection (first follow-up)—because beyond this period, nearly all participants began using additional analgesics other than paracetamol, introducing a confounding variable. Consequently, data collection beyond three weeks was rendered inconsistent and insufficient for meaningful analysis.

A one-way multivariate analysis of variance (MANCOVA) was used with a statistical power of 0.8, medium effect size, and alpha level set at 0.05. The required sample size was estimated at 40 patients per group.

This study was designed and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology guidelines.

Statistics

Categorical data were expressed as mean, standard deviation, or median based on normality test; the frequency and percentage were used to represent categorical data. The Wilcoxon signed-rank test was used to compare median differences in WOMAC pain, stiffness, function, total score, and depression score (PHQ-9) before and after IA-PRP injection. MANCOVA was used to assess mean differences in all outcome parameters during the post-test phase after controlling for baseline differences, age, and BMI. Cohen's r and partial eta-squared effect sizes were reported for clinical importance. A p-value < 0.05 was deemed statistically significant. SPSS IBM software Version 28 was used to analyze the data.

Results

As shown in Table 1, 130 patients were included in the study, with a mean age of 64.21 (±11.66) and a BMI of 30.54 (±4.06). The majority of patients were female (53.8%) compared to male (46.2%). The distribution of participants across the three OA grades was nearly equal: Grade 2 (33.1%), Grade 3 (33.8%), and Grade 4 (33.1%). Half of the patients received bilateral injections.

Variables	Category	Frequency	Percentage	Mean (SD)
Age / years	-	-	-	64.21 (11.66)
BMI	-	-	-	30.54 (4.06)
Gender	Male	60	46.2	-
	Female	70	53.8	
Osteoarthritis grades	Grade 2	43	33.1	-
	Grade3	44	33.8	
	Grade 4	43	33.1	
Side	Unilateral	63	48.5	-
	Bilateral	67	51.5	

Table 1: Patients' demographics and clinical data.

The Wilcoxon signed-rank test was used to identify statistically significant median differences in WOMAC subscales (pain, stiffness, function, and total score) and PHQ-9 scores pre- and post- IA-PRP injection; the results are presented in Table 2. Additionally, the Benjamini–Hochberg method was utilized to control for type-1 error (False Discovery Rate). The results showed that the median WOMAC pain score decreased from 7 (pre-injection) to 3 (post-injection), demonstrating a statistically significant difference and a large effect size. Similar improvements were observed in the median scores of WOMAC stiffness (pre-injection 1 to post-injection 0), WOMAC function (pre-injection 17 to post-injection 8), WOMAC total (pre-injection 24 to post-injection 11), and PHQ-9 (pre-injection 4 to post-injection 1)—all showing statistically significant differences and large effect size.

Variables	Pretest		Posttest		Z-value	Raw p-value	Cohen's Effect size (r)	Rank	*BH cutoff (i/5×0.05)	Sig if (p ≤ cutoff
	Median	IQR	Median	IQR						
WOMAC-Pain	7.0	5.25	3.0	6.0	9.99	<0.001**	0.876	1	0.01	Pass
WOMAC-Stuffiness	1.0	2.0	0.0	1.25	9.29	<0.001**	0.815	2	0.02	Pass
WOMAC-Function	17.0	12.25	8.0	12.0	9.89	<0.001**	0.867	3	0.03	Pass
WOMAC total	24.0	21.25	11.0	19.0	9.90	<0.001**	0.868	4	0.04	Pass
PHQ-9	4.0	2.0	1.0	3.0	10.03	<0.001**	0.880	5	0.05	Pass

P-values were adjusted using the Benjamini–Hochberg (BH) procedure to control the false discovery rate. Statistical significance was set at $p<0.05$. Significant p-values are denoted by * ($p<0.05$) and ** ($p<0.001$). Effect size (r) was interpreted as follows: 0.10 = small, 0.30= medium, and 0.50= large.

Table 2: Wilcoxon signed- rank for median differences between pre and post plasma infiltration treatment.

MANCOVA was used to verify the presence of statistically significant differences in post-injection WOMAC pain, stiffness, function, total score, and PHQ-9 after controlling for age, BMI, and baseline differences (see Table 3). Statistically significant differences were observed in all outcomes, as determined by the Bonferroni post hoc test. Patients in Grade 3 had lower WOMAC pain, stiffness, function, and total score compared to those in Grade 4, while patients in Grades 2 and 3 had lower PHQ-9 scores compared to those in Grade 4. Partial eta-values indicated small to moderate effect sizes for WOMAC pain, stiffness, function, and total score, and a large effect size for PHQ-9.

Dependent Variable	grades	Mean	Std. Error	F- value	P-value	Partial eta-square ηp2	Bonferroni Post hoc test	
							Grade	Sig
WOMAC-Pain	Grade 2	3.66	0.33	3.727	0.027 *	0.058	3 vs 4	0.017
	Gade3	3.46	0.21					
	Grade 4	4.73	0.40					
WOMAC-Stiffness	Grade 2	0.84	0.17	6.916	0.001 *	0.103	3 vs 4	0.010
	Grade3	0.51	0.11					
	Grade 4	1.22	0.21					
WOMAC-Function	Grade 2	11.12	0.72	3.937	0.002 *	0.061	3 vs 4	0.045
	Grade3	10.14	0.45					
	Grade 4	12.44	0.88					
Total WOMAC	Grade 2	15.62	0.95	6.876	0.001 *	0.102	3 vs 4	0.005
	Grade3	14.12	0.59					
	Grade 4	18.38	1.16					
PHQ9	Grade 2	1.22	0.17	12.436	<0.001 **	0.171	2 vs 4	0.001
	Grade3	1.14	0.11				3 vs 4	<0.001
	Grade 4	2.39	0.21					

P values were considered statistically significant at $p < 0.05$ and are denoted by * ($p<0.05$) and by ** ($p < 0.01$). Effect sizes are reported as partial eta squared (ηp^2) and interpreted as follows: = 0.01 -0.05 small, 0.06-0.013 medium, ≥0.14 large.

Table 3: Comparing of post-test pain, stiffness, function, total WOMAC and depression score between OA grades after controlling age, BMI and baseline differences as covariates using MANCOVA.

Discussion

This retrospective cohort study evaluated the clinical and psychological outcomes of IA-PRP injection in patients with KOA. The analysis included patients with K&L Grades 2, 3, and 4. The results showed significant improvement in pain, stiffness, physical function, and overall WOMAC scores, as well as a reduction in depressive symptoms (PHQ-9 scores) following treatment. These results lend credence to the growing body of literature suggesting that IA-PRP injection helps patients with mild, moderate, and severe KOA by enhancing their functional abilities and alleviating their symptoms. The significant reduction in WOMAC pain, stiffness, and function subscales observed in this study aligns with previous randomized controlled trials and meta-analyses reporting the superiority of PRP injections over placebo, hyaluronic acid, and corticosteroid injections in improving clinical outcomes [15-17,21].

The observed improvement across all WOMAC subscales suggests that PRP may exert a multimodal effect on joint physiology by enhancing cartilage repair, reducing inflammation, and modulating nociceptive pathways.

Additionally, the improvement in PHQ-9 scores highlights an often-overlooked dimension of OA: the psychological burden. Chronic pain and functional limitations are known contributors to depression and anxiety in patients with OA [22]. The post-treatment improvement in PHQ-9 observed in this study indicates that pain relief and functional gains following IA-PRP injection may also improve psychological well-being and overall quality of life.

Consistent with clinical expectations, the multivariate analysis showed that patients with Grade 2 and Grade 3 KOA achieved greater improvements in WOMAC subscales and PHQ-9 compared to those with Grade 4 [8,23].

While several studies—including the present one—have demonstrated significant improvements in pain and function following IA-PRP injections, recent meta-analyses and systematic

reviews have highlighted critical methodological limitations in the existing literature. Zhou et al. and Yi et al. note that despite frequent reporting of positive outcomes for IA-PRP injections, the overall methodological quality of existing studies remains low, with substantial overlap and inconsistent findings [24,25]. These limitations compromise the validity of the current evidence base and hinder definitive conclusions regarding the efficacy and comparative effectiveness of IA-PRP injections in managing KOA.

Limitations

A single assessment point was used due to the widespread use of additional analgesics after three weeks, which limited the reliability of subsequent data collection. This short follow-up period may not fully capture the long-term effects of IA-PRP injection, which are often reported to last for several months. Future prospective, randomized controlled trials with larger sample sizes and longer follow-up periods are needed to validate these findings.

Conclusion

IA-PRP injection demonstrated significant short-term improvements in pain, stiffness, function, and psychological well-being among patients with KOA, particularly those with mild to moderate disease severity. These findings support the therapeutic potential of PRP as an effective and well-tolerated option for managing KOA, especially in regions where surgical alternatives are limited due to accessibility and cost.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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Authors' Contributions

All authors contributed substantially to the conception and design of the study, data acquisition, analysis and interpretation of the results, and drafting and critical revision of the manuscript. Each author has reviewed and approved the final version of the manuscript prior to submission.

Conflict of Interest Disclosure

The authors declare that they have no commercial associations, financial interests, consultancies, equity interests, or patent licensing arrangements that could be constructed as a conflict of interest in connection with the work submitted.

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Previous Published Material Statement

Portion of this work were previously presented in abstract form. The full manuscript has not been published and is not under consideration elsewhere. Preliminary data from this study were presented as a poster at the 15the Jordanian Romanian Medical Conference (December 2025).

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