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INTRA-ARTICULAR PLATELET-RICH PLASMA VERSUS CORTICOSTEROIDS FOR THE TREATMENT OF KNEE OSTEOARTHRITIS: PROSPECTIVE COHORT STUDY

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Abstract:

Objectives: The present study compared and evaluated the effectiveness of intra-articular platelet-rich plasma (PRP) and corticosteroid injections in persons with osteoarthritis of the knee using the VAS and Knee Society Scores to measure changes in pain levels and functional results.

Study design: Prospective Cohort Study.

Study Place and Duration: Department of Orthopedics, Allama Iqbal Teaching Hospital DG Khan, from June 2025 to October 2025.

Methodology: Total of 240 participants aged of either gender with osteoarthritis were selected and classified in to two groups: Group-A (PRP; N=120) and Group-B (Corticosteroid; n=120). The patients with history of knee arthroscopy, intra-articular injection, rheumatoid arthritis (R-A factor positive), post trauma osteoarthritis and bleeding disorder, were excluded from the study. Group-A received intra-articular PRP, and Group-B received the corticosteroid. Patients were followed 15 weeks. Data were analyzed using statistical software (SPSS Version-31.0). Stratification was performed to control for potential confounder.

Results: The mean age of the study population was 57.45±12.65 years. Baseline demographic and radiological characteristics were comparable between groups ($p > 0.05$). At 15 weeks, the PRP group revealed comparably greater progress in pain management of knee osteoarthritis than the patients received corticosteroid. The mean KSS was 86.4 ± 8.7 in the PRP, Group-B while 72.9 ± 11.5 in the corticosteroid group-A ($p < 0.001$). Excellent to good functional outcomes were observed in 83.3% of patients receiving PRP compared to 46.7% in the corticosteroid group. Post-stratification analysis confirmed the superiority of PRP across age, gender, obesity, diabetes status, osteoarthritis grade, symptom duration, and surgeon experience.

Conclusion: PRP injection was more effective than corticosteroid injection in providing short-term pain relief and functional improvement in patients with moderate knee osteoarthritis. PRP appears to be a promising non-surgical therapeutic option for symptom management in this population.

Keywords: Knee osteoarthritis, Platelet-rich plasma, Corticosteroid injection, Knee Society Score, Pain management.

INTRODUCTION

Osteoarthritis (OA) is known as degenerative joint disease and is major cause of joint inflammation, limitations of movement and knees discomfort in old age patients.[1] Quality of life is hindered significantly by osteoarthritis disorder. This disease can affects the any joint of human skeleton but most probably appears in knees, feet and hips joints. In osteoarthritis, particular inflammatory C-reactive protein, cytokines, prostaglandins, and nitric oxide are produced in synovial fluid inducing proteinases resulting destruction of cartilages. The knee is the largest synovial joint and most commonly effected by osteoarthritis because of continuous use and high stress on this[2]. Severity of pain induced by osteoarthritis can be graded by a technique introduced by Kellgren–Lawrence grading system. Swelling of the affected joints, stiffness, limit range of joint mobility, and pain at night are some of the symptoms. This often become severe

enough to affect the quality of life by distressing emotional health.[4] Surgical care, including total knee arthroplasty, is the only proven treatment.[5] Physicians would use conventional methods, such as education of patients, physical activity, weight reduction, walking assistance, bracing devices, acupuncture, and electromagnetic treatment, to try to manage symptoms before surgery.[6] Pharmacological treatment alone is typically not satisfactory to achieve adequate symptoms control at initial stages of osteoarthritis. Patients who do not experience sufficient symptom alleviation from oral therapy regimens are typically the ones who receive intra-articular injections.[7] Despite their widespread use, hyaluronic acid injections are generally discouraged due to their hazardous effects and lack of substantial advantages over steroid injections.[8] Pretorius et al[9] made study on 29 patients (58 knees) suffering with mild-to-moderate bilateral knee osteoarthritis confirmed on radiological imaging. PRP and corticosteroids were equally suitable for improvement in pain, joint stiffness, and joint function at all-time points (mean WOMAC score at 26 weeks, PRP - 56.03±26.4, 8.1% improvement vs. Corticosteroid - 56.9±25.63, 3.9% improvement). Elksnins-Finogejevs et al[10] conducted a study where 40 patients with knee OA confirmed on imaging, were selected. They had established two groups each having 20 patients (PRP & CS-group). At 15th week, mean VAS, IKDC, and KSS scores in PRP group were 1.4±1.2, 78.7±11.4, and 88.8±9.4 compared to 3.6±2.1, 58.2±15.9 and 73.2±13.4 in corticosteroid group respectively. Napar et al[11] made a study to evaluate the effectiveness of platelet-rich plasma and prednisolone acetate intra-articular injections in patients with intermediate knee osteoarthritis. They concluded that both approaches equally effective for the pain management of knee osteoarthritis. Rana et al[12] made study for comparing platelet-rich plasma with Intra-Articular Corticosteroids for Knee Osteoarthritis Pain. They concluded that as compared to corticosteroids, PRP is a safe and effective treatment for short- to mid-term pain alleviation in patients with early-to-moderate KOA. Malahias et al[13] described that after the interphalangeal joints, the carpometacarpal joint of the thumb, also known as the trapeziometacarpal joint, is the second most common location of hand osteoarthritis. They described that application of PRP for pain management is very effective than corticosteroid and PRP had potential to reduce pain for 12 months. Sohail et al[14] documented that Joints, particularly larger joints like the knee, are affected by osteoarthritis. Over time, the joint cartilage deteriorates in this condition. This issue is one of the top five reasons by which adults become disabled. They suggested that patients who received intra-articular platelet-rich plasma experienced much greater pain relief than those who received intra-articular steroids. The current study was aimed to compare and assess the efficacy of intra-articular platelet-rich plasma and corticosteroid injections in patients with osteoarthritis of the knee using the VAS and Knee Society Scores to assess changes in pain levels and functional outcomes.

MATERIALS AND METHODS

A prospective cohort study was conducted in Department of Orthopedics, Allama Iqbal Teaching Hospital Dera Ghazi Khan after approved by the Ethical Review Board (Ref No: CPSP/REU/OSG-2023-112-3050; Dated 23 June 2025) and the duration of this study was from June 2025 to October 2025. The study involved the patients who were aged 40 to 65 years of gender with Kellgren-Lawrence grade II, III and IV knee osteoarthritis. The patients having history of knee arthroscopy, intra-articular injection, rheumatoid arthritis (R-A factor positive), post trauma osteoarthritis and bleeding disorder, were excluded from the study. All the patients taking corticosteroid treatments were designated as un-exposed and those receiving platelet-rich plasma were categorized as exposed.

DATA COLLECTION PROCEDURE

The sampling size comprising 240 patients (120 in each group) was calculated by using Open Epi based on mean KSS differences with 80% power and a 95% confidence level. All the patients who, fulfilling the inclusion criteria were selected after obtaining informed consent. Baseline data e.g., age (in years), gender (male or female), obesity (yes/no), diabetes mellitus (yes/no) and duration of osteoarthritis (months) and OA grade (II/III & IV) were recorded. Patients were undergoing either intra-articular PRP or corticosteroid depending on the severity of osteoarthritis and patient / surgeons' willingness and preference. The intra-articular injection into knee was administered under aseptic condition. Individuals in the intra-articular PRP treatment (Group-A) were received 8 mL of PRP, and patients undergoing intra-articular corticosteroid treatment (Group-B) were given a combination of 5 mL of 2% lidocaine and 1 mL of 40 mg/ml triamcinolone acetonide. Arthrocentesis were performed in both groups. All procedures were performed by the surgeon with ≥3-year post fellowship experience as per hospital protocol. All the patients were followed every 2-weeks till 15-weeks post-intervention. The final outcomes were assessed by orthopedic surgeon neither involved in the study nor aware of treatment assigned. The patients were evaluated by VAS and KSS and categorized as per operational definition..

STATISTICAL EXPLORATION

Primary data were examined by using statistical software (SPSS Version-31.0). The numerical data was assessed through Shapiro-Wilk test for confirmation of Normality. Mean and SD were calculated for age, duration of osteoarthritis, surgeon's experience, VAS and KSS. Frequency and percentages were calculated for gender, obesity, diabetes mellitus and grade of osteoarthritis. The variables including surgeon's experience, grade of osteoarthritis,

age, duration of osteoarthritis, gender, obesity and diabetes mellitus was explored by making stratified post stratification analysis.

RESULTS

A total of 240 patients taking knee injections for osteoarthritis were selected for this research. The findings reveal that the mean age of the study population was 57.45±12.65 years. The result (Table 1) demonstrated that among Group A (PRP), 87 (72.50%) patients were females and 33 (27.50%) patients were males. Out of the study population, 50 were males and 40 were females. The results (Table) described that there was no significant variance in mean age (57.45 ± 12.65; p = 0.210) and gender (Female, p = 0.621; Male, p = p=0.342) of both groups in terms of demographic profile. Patients in both groups had their x-rays evaluated for osteoarthritis (OA) using Kellgren and Lawrence osteoarthritis grades, as shown in Table II. NRS had a significant p-value of 0.001 after treatments, compared to 0.998 before treatment (Table III).

Table I: Comparison of demographic profile of two groups (A & B).

Variables	Group A (PRP) n=120	Group B (Corticosteroid) n=120	F-value	P-value
Age in years	57.45 ± 12.65	57.92 ± 12.91	4.876	0.210
Gender				
Female	87 (72.50%)	85 (70.84%)	5.113	0.621
Male	33 (27.50%)	35 (29.16%)	3.191	0.342

Table II: Comparison of Groups-A and Group-B in term of Kellgren and Lawrence osteoarthritis grades

Variables	Group A (PRP) n=120	Group B (Corticosteroid) n=120	F-value	P-value
Grade-ii	18 (15.00%)	16 (13%)	3.219	0.346
Grade-iii	61 (50.83%)	64 (53%)	4.104	0.718
Grade-iv	41 (34.17%)	40 (33%)	2.339	0.519

Table III: Comparison of Groups-A and Group-B in term of Numeric Rating Scale (NRC)

Variables	Group A (PRP) n=120	Group B (Corticosteroid) n=120	F-value	P-value
Pre-Treatment Numeric Rating Scale	18 (15.00%)	16 (13%)	2.436	0.219
Post- Treatment Numeric Rating Scale	61 (50.83%)	64 (53%)	2.781	0.718

Functional Outcome (Knee Society Score)

Functional assessment using the Knee Society Score revealed significantly better outcomes in the PRP group. The mean KSS at 15 weeks was 86.4 ± 8.7 in the PRP group compared to 72.9 ± 11.5 in the corticosteroid group ($p < 0.001$) (Table 3). When KSS outcomes were categorized, excellent to good results were observed in 83.3% of patients in the PRP group, compared to 46.7% in the corticosteroid group. Conversely, fair to poor outcomes were more frequent among patients receiving corticosteroids (Table IV).

IV: Functional outcomes based on Knee Society Score (KSS) at 15 weeks

Outcomes	Group-A (PRP)	Group-B (Corticosteroid)	*p-Value*
Mean KSS(±SD)	86.4 ± 8.7	72.9 ± 11.5	<0.001
Excellent –Good (%)	83.30%	46.7%	
Fair- Poor(%)	16.70%	53.3%	

Stratification Analysis

Analysis of Stratification was performed for potential confounders including age, gender, obesity, diabetes mellitus, grade of osteoarthritis, duration of symptoms, and surgeon's experience. Post stratification analysis demonstrated that PRP remained significantly superior in improving both VAS and KSS scores across all strata ($p \leq 0.05$), indicating that the observed outcomes were independent of these variables.

Table V: Post-Stratification Analysis of Functional Outcomes

Variables	Group-A PRP vs Corticosteroid	*P-values*
Gender	PRP significantly greater	P<0.005
Age	PRP significantly greater	P<0.005
Obesity	PRP significantly greater	P<0.005
Diabetes Mellitus	PRP significantly greater	P<0.005
Osteoarthritis Grade	PRP significantly greater	P<0.005
Symptom Duration	PRP significantly greater	P<0.005
Surgeon's Experience	PRP significantly greater	P<0.005

DISCUSSION

The present prospective cohort study was done in patients with pain and disability because of early to moderate Knee osteoarthritis. 240 patients in two groups were subjected for treatment with I/A PRP and CS. The findings of the current investigation revealed that I/A PRP injection exhibited comparable potential for pain management than corticosteroid injection applied to the patients with knee osteoarthritis at 15 weeks follow up and support the growing body of evidence favoring biological treatment in contrast with application of conventional anti-inflammatory injection for knee osteoarthritis pain management. The significant lower VAS score recorded in the Group-A (PRP), indicating the regenerative potential. Similar outcomes were also reported by Migliorin et al[15] and Filardo et al[16]. Beside of these, higher values of mean Knee Society Scores (KSS) were also achieved by PRP treatments resulting excellent to good functional outcomes in this study. Posts-stratification analysis suggested that excellent functional out comes of PRP injection application for the pain management caused by knee osteoarthritis independent of patient age group, gender, diabetic history, obesity induced disorders, osteoarthritis grades, and symptoms duration confounders. The biochemical properties suggested that PRP comprises of rich platelets cells which produce growth factor including insulin-like growth factor (IGF-1), transforming growth factor -β (TGF-β), platelets derived growth factor (PDGF) and vascular endothelial growth factor (VEGF), which regulates cartilage regeneration, tissue repairs and control the inflammation. In contrast, corticosteroids provide short term pain relief by suppressing the inflammatory mediatory. Furthermore it does not contribute bones healing and possess damaging effects on cartilage with regular consumption. The significant existing difference among mode of action and mechanism may explain the sustained functional improvement recorded with PRP at 15 weeks. Our findings are similar to results demonstrated by Guermazi et al[17]. Elksniņs-Finogejevs et al[10] revealed that because of its trophic qualities and capacity to regulate inflammatory processes, PRP intrusions is a best tool for pain management in musculoskeletal disorder. After five weeks, both groups' subjective scores showed a significant improvement, and there were no discernible differences between them. Followed by 15 weeks, the group-A significantly outperformed the CS group in every category. A long term evaluation (approximately one year) revealed that there were excellent outcome in patients treated with PRP than those who received CS. This similarity indicates that PRP provides more long term symptomatic and functional improvement and supports the external validity of our findings. These outcomes were line parallel with the finding reported by Dai et al[18]. However, not all studies reported favorable superior outcomes of PRP for pain relief of knee osteoarthritis. WOMAC scores were used by Pretorius et al[9] to report similar improvements between PRP and corticosteroids at 26 weeks, with only slight percentage differences between the groups. Differences in sample size, injection technique, OA severity, and outcome measurement instruments could be the cause of the disparity. It is possible that our stratified analysis and larger sample size (n=240) gave us more statistical power to find significant differences. International health concerns authorities are increasingly recognizing the potential role of PRP for the management of knee osteoarthritis pain. Moreover, biological injections may be beneficial for some individuals who do not respond well to conventional treatment. Particularly among the local population, our study contributes to the increasing amount of evidence. The application of stratification approach to govern for confounding factors is significant strength of present study. PRP sustained statistically significant advantages (P<0.001) to manage knee osteoarthritis and functional outcomes though after controlling for demographic and demographic variables[16]. This exhibits that the prime factor encountering improved outcomes was the treatment modality itself, not the initial patients. Furthermore, observed bias was declined by having an impartial orthopedic surgeon explore the outcomes. However, some boundaries and limitations should be introduced in this realm. After fifteen week period follow-up is insufficient to examine the advantages in term of long-term sustainability. Because treatment applied was partly depends on orthopedic surgeon preferences, which may present selection bias, and randomization was not applied. In

addition, post-intervention radiological improvement and functional outcomes was not explored. It is suggested that standard treatment guideline and boundaries should established by future randomized controlled trails along with standardized PRP preparation procedures.

CONCLUSION

The findings of the present study suggested that persons suffering moderate knee osteoarthritis, application of intra-articular PRP dose is strongly effective than corticosteroid conventional pharmacological treatment in terms of both short-term pain relief and functional recovery. For some patients looking for non-surgical treatment of knee OA, PRP may be a more effective therapeutic option due to its regenerative potential and favorable clinical profile.

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