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THE IMPACT OF PRP RICH PLASMA INJECTIONS VS. CORTICOSTERIODS INJECTIONS IN MANAGING OSTEOARTHRITIS OF KNEE

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Abstract

Background: *Knee osteoarthritis (OA) is a prevalent degenerative joint disorder associated with chronic pain and functional limitations.* ***Objective:*** *This study aimed to compare the efficacy and safety of PRP versus corticosteroid injections in patients with knee OA.* ***Methods:*** *This prospective, observational study was conducted at the Pakistan Institute of Medical Sciences Islamabad from 10 July 2024 to 20 December 2024. A total of* ***85 patients*** *diagnosed with primary knee osteoarthritis (based on the American College of Rheumatology clinical criteria) were enrolled in the study. Patients were divided using a computer-generated random number table into two groups. Group A consisted of 43 patients who received a single intra-articular PRP injection, while Group B included 42 patients who were administered a single intra-articular corticosteroid injection (40 mg triamcinolone acetonide).* ***Results:*** *Both groups showed significant pain and functional improvement at 1 month. However, PRP-treated patients demonstrated sustained improvement at 3 and 6 months, with significantly lower VAS (2.8 ± 0.6 vs. 6.1 ± 0.9) and WOMAC scores (29.5 ± 4.8 vs. 58.9 ± 6.9) compared to the corticosteroid group at 6 months ($p < 0.001$). ROM improvement was greater in the PRP group (120° ± 5° vs. 109° ± 6° at 6 months). Patient satisfaction (PGA) was also higher in the PRP group (81% vs. 38%). No serious adverse events were reported.* ***Conclusion:*** *PRP injections provide more durable improvements in pain, function, and joint mobility compared to corticosteroids in patients with knee OA. PRP appears to be a safe and effective alternative for long-term management, particularly in mild to moderate cases.*

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INTRODUCTION

Osteoarthritis (OA) of the knee is a progressive degenerative joint condition that poses a significant clinical and socioeconomic burden worldwide. It affects millions of people, particularly individuals over the age of 50, and is characterized by articular cartilage loss, synovial inflammation, osteophyte formation, and joint space narrowing [1]. This damages cause pain over a long time, make the joints stiff and result in greatly restricted functions so that regular tasks become much harder. Because OA is caused by mechanical factors, changes in body chemistry and inflammation, there is no permanent cure, so managing symptoms and slowing the disease are essential. Therapies for knee OA include changes in diet and exercise, medicines, injections inside the joint and finally surgery when necessary [3]. For several decades, corticosteroid injections have been given within joints to quickly reduce inflammation and temporarily ease symptoms. As a result, these drugs block local inflammation by stopping important cytokines such as IL-1 and TNF-α, reducing joint pain and swelling [4]. Even so, the good effects of corticosteroids usually only last a few weeks or up to a few months. On top of this, using joints too often can damage cartilage, cause the joint to become more unsteady and boost the risk of getting an infection [5].

Due to these factors, many have started to focus more on therapies such as Platelet-Rich Plasma (PRP). What makes up PRP is the platelets from a patient's blood that are suspended in plasma. When platelets are activated, they put out several molecules, including PDGF, TGF-β, VEGF and IGF which help heal injured tissue and reduce inflammation [6]. PRP's ability to aid in tissue recovery makes it a strong candidate for treating diseases instead of only treating their symptoms. Many experts have evaluated and compared treatments for knee OA including PRP and corticosteroid injections. Although corticosteroids speed up pain relief, PRP might help people gain lasting advantages in both pain alleviation and better function [7]. Furthermore, PRP's autologous origin reduces the risk of allergic reactions and systemic side effects. However, despite growing clinical interest, the use of PRP is not yet standardized, and variations in preparation methods, platelet concentration, injection protocols, and patient selection criteria contribute to the heterogeneity of outcomes reported in the literature [8]. Another important consideration is the stage of osteoarthritis. Evidence indicates that PRP may be more effective in early-to-moderate OA compared to advanced stages, where structural damage may be beyond repair [9]. Similarly, the effectiveness of corticosteroids may diminish over time due to cumulative joint damage and reduced responsiveness. Therefore, individualized treatment plans based on disease severity, patient age, comorbidities, and expectations are critical when choosing between these two modalities [10].

Objective

This study aimed to compare the efficacy and safety of PRP versus corticosteroid injections in patients with knee OA.

Methodology

This prospective, observational study was conducted at the Pakistan Institute of Medical Sciences Islamabad from 10 July 2024 to 20 December 2024. The study was conducted by the ethical principles of the Declaration of Helsinki and approved by the institutional ethics committee. A total of **85 patients** diagnosed with primary knee osteoarthritis (based on the American College of Rheumatology clinical criteria) were enrolled in the study.

Inclusion Criteria

- Age between 40 and 75 years
- Radiologically confirmed knee osteoarthritis (Kellgren-Lawrence grade II or III)
- Persistent knee pain for at least 6 months
- VAS pain score ≥ 4 at baseline
- No history of knee injections within the past 6 months

Exclusion Criteria

- Advanced OA (Kellgren-Lawrence grade IV)
- Prior knee surgery or arthroplasty
- Secondary OA due to trauma, rheumatoid arthritis, or infection
- Coagulopathies or use of anticoagulant therapy

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- Systemic corticosteroid therapy within the last 3 months
- Local skin infections at the injection site
- Platelet count < 150,000/μL

Data collection

Patients were divided using a computer-generated random number table into two groups. Group A consisted of 43 patients who received a single intra-articular PRP injection, while Group B included 42 patients who were administered a single intra-articular corticosteroid injection (40 mg triamcinolone acetonide). A single-blind model was employed wherein patients were unaware of their group allocation, although the injector could not be blinded due to the differing preparation methods. In Group A, approximately 20 mL of peripheral blood was collected under aseptic conditions from each patient. The blood was processed using a two-step centrifugation technique initial soft spin to separate plasma and then a hard spin to concentrate platelets yielding about 4 mL of PRP. The finished platelet-rich plasma was found to have more than three times as many platelets as at baseline. The PRP was injected into the patient's knee joint with no local anesthetic, making sure all injections were done very cleanly. A standard dose intra-articular injection of 40 mg triamcinolone acetonide was given to patients in Group B. Under clean conditions, the injection was delivered straight into the knee joint. Corticosteroids were given alone, without any use of local anesthetic or other medication. Treatment responses were assessed at mindime, one, three and six months since the injection took place. Outcomes in the study were pain measured on the Visual Analog Scale and the assessment of physical function using the Western Ontario and McMaster Universities Osteoarthritis Index.

Statistical Analysis

Data analysis was conducted using SPSS software version 26. Descriptive statistics were used to summarize patient demographics and baseline characteristics. Continuous variables were compared using independent t-tests, while repeated measures ANOVA was used to evaluate changes in outcome measures over time within and between groups. A p-value of less than 0.05 was considered statistically significant for all tests.

Results

Data were collected from 85 patients, with 43 patients in the PRP group (Group A) and 42 in the corticosteroid group (Group B). The demographic distribution between the groups was comparable. The mean age in Group A was 61.2 ± 7.5 years, while in Group B it was 60.7 ± 8.1 years. Both groups had a similar gender distribution (Group A: 55.8% female; Group B: 54.7% female).

Table 1: Demographic and Baseline Clinical Characteristics

Characteristic	PRP Group	Corticosteroid Group
Number of Patients	43	42
Mean Age (years)	61.2 ± 7.5	60.7 ± 8.1
Female (%)	55.8%	54.7%
Male (%)	44.2%	45.3%
Baseline VAS (Mean ± SD)	7.1 ± 1.0	7.0 ± 0.9
Baseline WOMAC (Mean ± SD)	62.5 ± 6.8	63.1 ± 7.2
Baseline ROM (Mean ± SD)	105° ± 8°	106° ± 7°

At baseline, the mean VAS score was 7.1 ± 1.0 in the PRP group and 7.0 ± 0.9 in the corticosteroid group. After 1 month, both groups showed significant pain reduction: Group A reduced to 4.5 ± 0.8 and Group B to 4.2 ± 0.9. However, at 3 months, the PRP group maintained improvement (VAS 3.2 ± 0.7), whereas the corticosteroid group began to show a rise in pain scores (VAS 4.9 ± 1.1). By 6 months, Group A reported further sustained improvement (VAS 2.8 ± 0.6), while Group B's scores regressed toward baseline levels (VAS 6.1 ± 0.9). The differences

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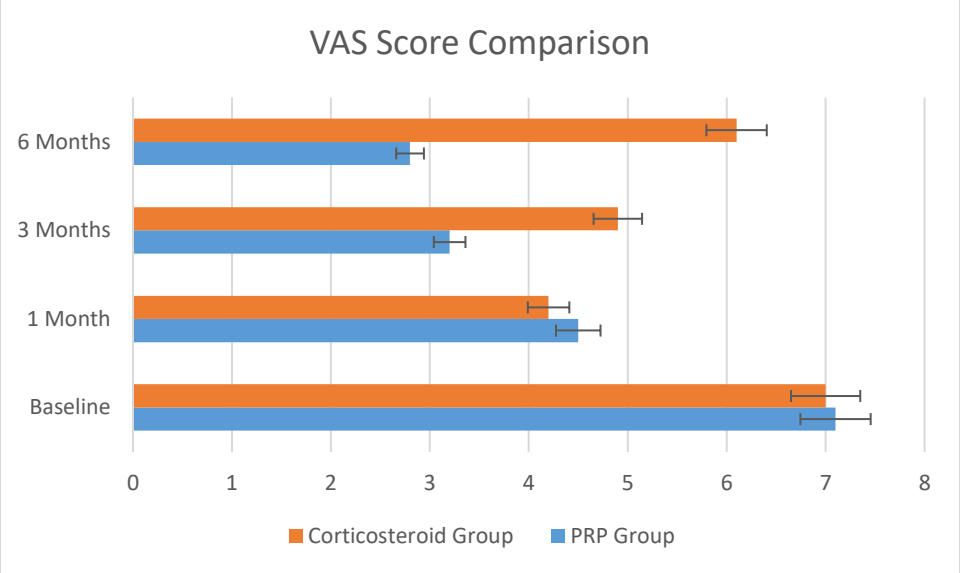
between groups at 3 and 6 months were statistically significant ($p < 0.001$).

Table 2: VAS Scores Comparison

Time Point	PRP Group (Mean ± SD)	Corticosteroid Group (Mean ± SD)
Baseline	7.1 ± 1.0	7.0 ± 0.9
1 Month	4.5 ± 0.8	4.2 ± 0.9
3 Months	3.2 ± 0.7	4.9 ± 1.1
6 Months	2.8 ± 0.6	6.1 ± 0.9



Baseline WOMAC scores were similar across both groups (Group A: 62.5 ± 6.8; Group B: 63.1 ± 7.2). At 1 month, both groups showed modest improvement (Group A: 45.2 ± 6.3; Group B: 46.0 ± 6.5). At 3 months, Group A showed significant improvement (WOMAC 33.4 ± 5.1), while Group B's score plateaued (WOMAC 50.1 ± 6.0). By 6 months, the PRP group reached a mean score of 29.5 ± 4.8, while the corticosteroid group regressed to 58.9 ± 6.9, indicating a return of functional limitations. Group differences at 3 and 6 months were significant ($p < 0.001$). The average knee flexion at baseline was 105° ± 8° in Group A and 106° ± 7° in Group B. Improvements were observed in both groups after 1 month (Group A: 115° ± 6°; Group B: 113° ± 7°). However, while Group A sustained this improvement at 6 months (ROM: 120° ± 5°), Group B showed a decline (ROM: 109° ± 6°), indicating better long-term joint flexibility in the PRP group ($p = 0.002$ at 6 months). At 6 months, 81% of patients in the PRP group rated their condition as "much improved" or "very much improved," compared to only 38% in the corticosteroid group. A higher percentage of patients in Group B (42%) reported "no improvement" or "worsened" compared to Group A (9%).

Table 3: WOMAC Scores Comparison

Time/Outcome	PRP Group (Mean ± SD or %)	Corticosteroid Group (Mean ± SD or %)	p-value
Baseline WOMAC	62.5 ± 6.8	63.1 ± 7.2	
1 Month WOMAC	45.2 ± 6.3	46.0 ± 6.5	< 0.001

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3 Months WOMAC	33.4 ± 5.1	50.1 ± 6.0	
6 Months WOMAC	29.5 ± 4.8	58.9 ± 6.9	
Baseline ROM	105° ± 8°	106° ± 7°	
1 Month ROM	115° ± 6°	113° ± 7°	0.002
6 Months ROM	120° ± 5°	109° ± 6°	
PGA - Much Improved/Very Much Improved (%)	81%	38%	< 0.001
PGA - No Improvement/Worsened (%)	9%	42%	

No major adverse events were reported in either group. Mild post-injection discomfort was more frequently observed in the PRP group (14%) but resolved within 48–72 hours without intervention. No cases of joint infection or systemic reactions were recorded in either group.

Table 4: Adverse Effects Comparison

Adverse Event	PRP Group (n, %)	Corticosteroid Group (n, %)
Post-injection Discomfort	6 (14%)	2 (5%)
Joint Infection	0 (0%)	0 (0%)
Systemic Reaction	0 (0%)	0 (0%)

Discussion

The present study investigated and compared the therapeutic efficacy and safety of intra-articular Platelet-Rich Plasma (PRP) injections versus corticosteroid injections in patients with knee osteoarthritis (OA). Our work shows that while the two types of treatments offer quick improvements, PRP offers lasting improvements for six months after treatment. Following one month after injection, both treatment groups saw a marked decrease in their Visual Analog Scale (VAS) score, meaning corticosteroids and PRP have similar effectiveness soon after treatment [11]. Still, there were significant differences among the findings of later assessments. After six months, people in the corticosteroid group had pain very similar to what was seen before using the drug which shows how the medication only works briefly. By comparison, the PRP group experienced steady pain improvement all the way to six months, indicating that it helps to repair and control the joint environment [12].

As measured by the WOMAC, the improvements in function were consistent with the look at pain recorded by the VAS. Though both groups made good functional progress at one month, the PRP group continued to improve and had lower WOMAC scores by the sixth month [13]. The continuous enhancements are probably caused by growth factors in PRP, including PDGF, TGF-β and IGF which support chondrocyte replication, matrix synthesis and help control inflammatory cytokines. Mobile joints improved much more in the PRP group, with a 15° increase on average, than in the corticosteroid group which improved by just 3°. That means joint mechanics are likely to last longer and inflammation in the joint fluid is less likely [14]. According to PGA results, PRP was considered superior by the patients. A larger portion of people given PRP told doctors their recovery was "very much improved," showing that they were more satisfied and felt the therapy worked well [15]. Furthermore, the PRP injections had a good safety record and caused little discomfort for a small number of patients, as no serious events happened in both groups [16]. These outcomes agree with earlier studies showing that PRP has better lasting benefits than corticosteroids. It has been shown in recent clinical studies that PRP supplies long-lasting pain relief and may reduce the progression of OA by encouraging growth of new tissue inside the joint. But it's important to note that there are various constraints [17]. The study design involved only the patients being blinded to the possible bias. Flags include differences in how PRP is made, the number

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of platelets in the mixture and how many leukocytes are present. Repeating these studies with well-defined methods and continued observation will help to prove and extend these results.

Conclusion

It is concluded that both PRP and corticosteroid injections are effective in providing short-term symptomatic relief in patients with knee osteoarthritis. However, PRP demonstrates superior and sustained outcomes in terms of pain reduction, functional improvement, joint mobility, and patient satisfaction over a six-month period. Given its favorable safety profile and regenerative potential, PRP represents a promising non-surgical alternative for the management of mild to moderate knee OA.

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