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Research Article

Assessment of Pain and Functional Outcome between Intra-Articular Corticosteroids and Platelet Rich Plasma (Prp) in Treatment of Knee Osteoarthritis: A Prospective Observational Cohort Study

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Abstract:

Background-Osteoarthritis is the most prevalent type of arthritis, which significantly impacts the patient's mobility and quality of life. Although pharmacological treatments like corticosteroids can provide immediate pain relief and enhance mobility and quality of life for osteoarthritis patients, their long-term effectiveness is limited.

Material and Method- Forty patients affected by symptomatic radiologically confirmed knee osteoarthritis (Kellgren Lawrence grades II–III) were enrolled in this study. In the study, 30 patients were assigned to the PRP group and received a 5 mL intra-articular injection of PRP, while another 30 patients were randomized to the corticosteroid group and received an intra-articular injection of triamcinolone acetonide (2 mL of 40 mg/mL) and lidocaine (3 mL of 2%). The VAS, IKDC, and WOMAC scales were used to evaluate pain and function of the target knee at baseline, 1.5 months, and 3 months after treatment.

Result- Patients who received PRP treatment exhibited better outcomes compared to those who received corticosteroids after 3 months.

Conclusion- The study found that both corticosteroids and PRP intraarticular injections provided relief from joint pain and improved joint function..

Keywords: Osteoarthritis Knee, Platelet-rich Plasma, Corticosteroid

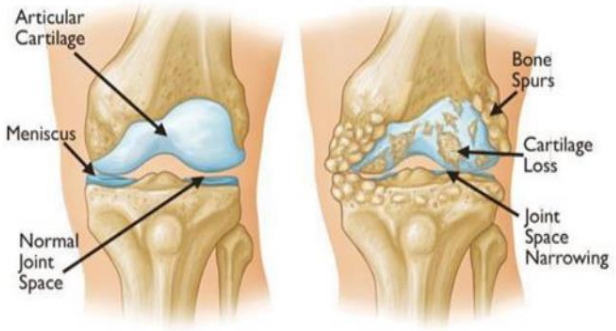
Introduction: Etiopathogenesis

Osteoarthritis is a joint disease that involves the abnormal remodelling of joint tissues due to various inflammatory mediators present in the

affected joint. Contrary to popular belief, it is not solely a result of wear and tear. The primary characteristic of the disease is the destruction of cartilage. Osteoarthritis has a multifactorial etiology with risk factors such as obesity, aging, joint injury, and genetic predisposition. The loss of articular cartilage usually starts as a focal lesion that progressively expands and leads to changes in loading, ultimately causing cartilage loss.

The process of cartilage loss in osteoarthritis involves morphologic and metabolic changes in chondrocytes, as well as biochemical and structural alterations in the extracellular matrix (ECM), which are influenced by various mechanical, biological, biochemical, molecular, and enzymatic feedback loops. The cause of synovial inflammation in osteoarthritis is still unclear and may be due to either a foreign body reaction of synovial cells to degraded cartilage products inside the joint or a primary trigger of the osteoarthritis process. However, it is believed that synovial cells produce inflammatory mediators, activate chondrocytes, and propagate cartilage breakdown. Evidence supports the correlation between synovitis and symptom severity and the rate of cartilage degeneration.

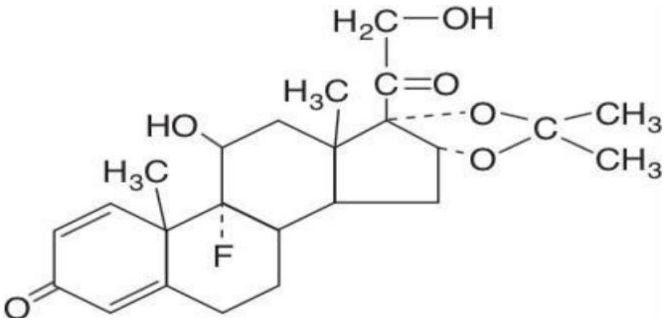
It is now well-established that inflammatory mediators play a significant role in the development and progression of structural changes in the osteoarthritis joint. The induction of various proinflammatory mediators in the cartilage, synovial membrane, and subchondral bone, including their signaling pathways, are interlinked and overlapped. The exact role of inflammatory mediators in regulating cartilage damage and defective repair mechanisms in osteoarthritis is still controversial, as it is unclear whether they are primary or secondary regulators.



Articular surface of knee joint

Pharmacology of triamcinolone acetonide: Triamcinolone acetonide is a synthetic glucocorticoid, a potent derivative of triamcinolone. It is widely used topically to treat various skin conditions, to relieve the discomfort of mouth sores and intra-articularly to treat various joint conditions.

Chemical structure:



Chemical structure of Triamcinolone Acetonide

Pharmacology:

Triamcinolone acetonide is a synthetic halogenated cyclic ketal pregnane corticosteroid

with a glucocorticoid activity and virtually no mineralocorticoid activity. It is eight times as potent as prednisone. Triamcinolone acetonide has anti-inflammatory and immunosuppressant activity. Glucocorticoids helps in preventing inflammation.

Platelet-Rich Plasma: Platelet-rich plasma (PRP) can be defined as the volume of the plasma fraction from autologous blood with a platelet concentration above the baseline count. Platelets contain many important bioactive proteins and growth factors (GFs). These factors regulate key processes in tissue repair, including cell proliferation, chemotaxis, migration, cellular differentiation, and extracellular matrix synthesis. PRP is valuable because it can contain high concentrations of platelet-derived growth factors and fibrin, which aid in wound healing, soft tissue reconstruction, and bone reconstruction and augmentation. Its therapeutic application in osteoarthritis has become increasingly relevant due to the rising incidence and prevalence of joint pathology over the past two decades. This has led to a focus on interventions that can potentially reverse or improve the progression of joint damage and pathology. The disease is the result of a long chain of events, but some of the links in that chain are still a mystery; nobody is certain which link to cut in order to stop disease progression. When discussing PRP therapies, differences between the preparations and the re-administration procedures used should be acknowledged. The pursuit to identify a unifying therapy for osteoarthritis would be enhanced by refining the end points in future clinical studies.

MATERIALS AND METHODS

Study Design: Patients having osteoarthritis in (n=60) who had fulfilled our inclusion criteria during the study duration had been enrolled in our study. For clinical assessment, we had collected the patient age, sex, weight, diet, and medical history of patient etc. through a source document form. After a thorough clinical assessment, the diagnosis of osteoarthritis was confirmed by the X-ray knee of the patient in a standing position and graded according to the Kellgren-Laurence classification of osteoarthritis. All the patients were advised weight loss programs and physiotherapy for quadriceps strengthening exercises. Pain has been measured by VAS, WOMAC, and IKDC scales, before giving treatment.

All the patients in the study were randomly divided into 2 groups based on computer-generated random numbers: Group PRP & Group corticosteroids.

Group PRP: 5 ml of intraarticular injection of autologous PRP was injected into the affected knee.

Group corticosteroid: 5 ml of intraarticular injection (2 ml of triamcinolone acetonide + 3 ml lignocaine 2 %) was injected into the affected knee.

The intra-articular injections were performed under all aseptic precautions put on a patient basis and the patients were allowed to go home two hours after the procedure. Patients were instructed to take rest for 1 day after the injection. Patients were advised to avoid strenuous activities involving the injected knee. Patients were cautioned about the flare-up, which can include an increase in pain and swelling of the injected knee joint.

For the patients in the group corticosteroid, a single dose of five ml of a mixture containing 3 ml of 2% lignocaine & 2 ml of triamcinolone acetonide (containing 80 mg) was injected in the index knee joint. For patients in the group PRP, venous blood drawn by phlebotomy was used to prepare five ml of PRP, patients received 2 doses of intraarticular injection of plasma-rich platelet at 15 days interval which was injected into the index knee joint.

Preparation of PRP: Using aseptic precautions, thirty ml of venous blood, drawn by phlebotomy using 22 G needle, was collected into vacutainers containing citrate, phosphate and dextrose (CPD 3.2%) as anticoagulant. The PRP was prepared using centrifuge machine by double spinning method to achieve a greater PRP yield. First spin was done at 1500 rotations per minute (rpm) for 5 minute to separate the erythrocytes. The supernatant fluid, which was devoid of erythrocytes, was then subjected to the second spin at 3500 rpm for 15 minutes, and the five ml of PRP obtained, was used to perform the intra articular injection.

STATISTICAL

The data obtained was analysed using the Statistical Package for Social Science (SPSS 21.0 version). All continuous data were expressed in terms of the mean and the standard deviation of the mean. T test was performed to assess the differences in mean of the two groups. Repeated measures of continuous variables, repeated measure ANOVA was done for within group. Two-way repeated measure ANOVA done for between groups difference over time. The non-parametric Pearson's Chi square test was performed to investigate the relationships between grouping variables. For all tests, $p<0.05$ was considered significant.

Result:

Age distribution according to age range

Age	Total Number of Patient
45-49	10
50-54	11
55-59	13
60-64	18
65-69	5
70-74	3

Tab. 1- Age distribution according to age range

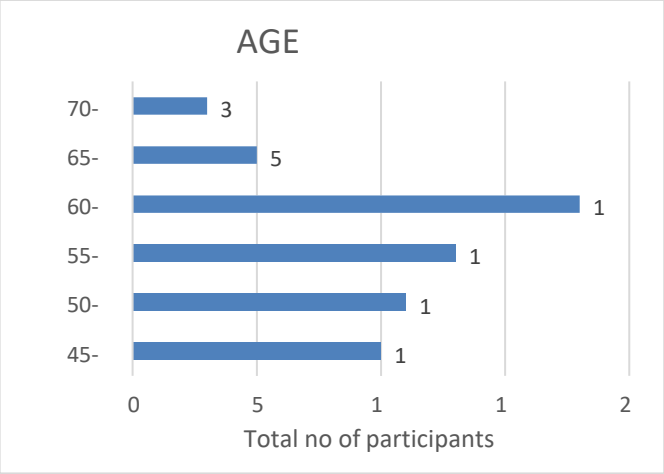


Fig. 1- Age distribution

Result- In this study minimum age range was 45-49 and maximum age range was 70-74. Out of total 60 patients, maximum knee osteoarthritis cases had been reported in 60-64 age group, which were found to be 18.

Gender distribution according to number of populations

Gender	Number
Male	25
Female	35

Tab. 2- Gender distribution according to number of populations

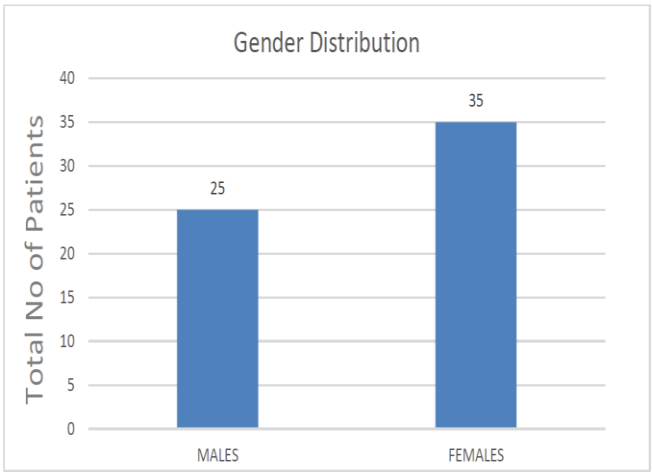


Fig. 2. - Gender distribution

Result- In this study out of 60 patients, 25 were male and 35 were female. Which clearly indicates that female was more effected than male with knee osteoarthritis.

Therapeutic group classification according to population

Therapy Group	Number of Patients
Corticosteroid	30
PRP	30

Tab. 3- Therapeutic group classification

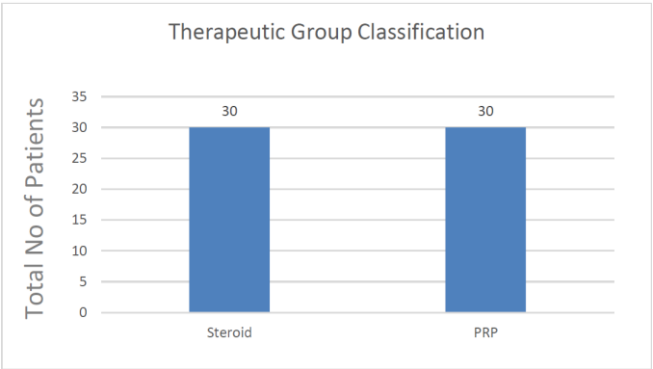


Fig. 3- Therapeutic group classification

Result- Total number of patients were equally divided into two groups, out of which 30 patients had considered under corticosteroids group and rest of another 30 had considered under PRP groups.

Mean VAS score follow-ups between corticosteroid and PRP patients

VAS Score	Group Corticosteroid (Mean ± SD)	Group PRP (Mean ± SD)	P Value
Before	7.54 ± 0.576	7.42 ± 0.690	0.47
After 1.5 months	5.11 ± 0.424	4.70 ± 0.724	0.19
After 3 months	3.26 ± 0.712	2.259 ± 0.859	0.00

Tab. 4- Mean VAS scores at follow-ups between the two groups

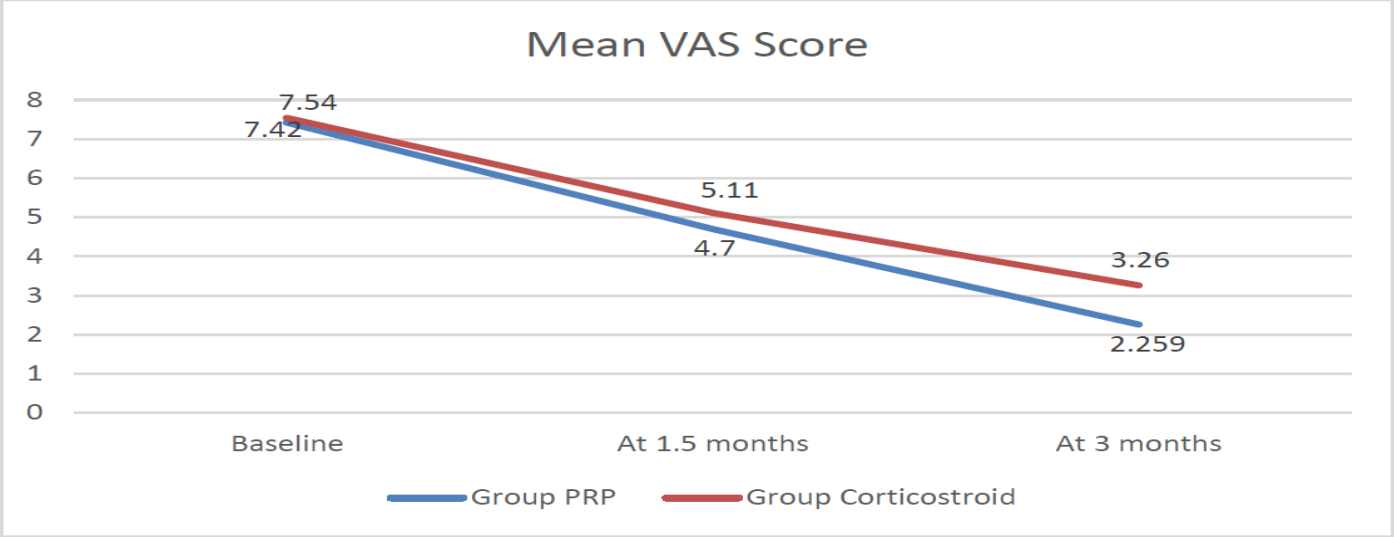


Fig. 4- Mean VAS score at follow-ups between the two groups

Result- The baseline mean VAS score in the group PRP was 7.42 with a standard deviation of 0.0690, while that in group corticosteroid mean was 7.54 with SD of 0.576. Both the groups were comparable with respect to baseline VAS score (p value=0.47). The mean VAS score at 1.5 months follow-up in the group PRP was 4.70 with SD of 0.724, whereas that in the group corticosteroid was 5.11 with SD of 0.424. At 1.5 months follow-up, the VAS score in the group PRP was significantly lower when compared to the group steroid (p value = 0.19). At 3 months follow-up, the mean VAS score in group PRP was 2.259 with SD of 0.859 which is lower than that of group corticosteroid (mean 3.26 with SD of 0.72) with high statistical significance (p value = 0.00). Within both the groups also, there were significantly lower VAS score when compared to their baseline value (p value = 0.47).

Mean IKDC score follow-ups between steroid and PRP patients

IKDC Score	Group corticosteroid (Mean ± SD)	Group PRP (Mean ± SD)	P Value
Before	37.54 ± 6.405	41.09 ± 6.41	0.51
After 1.5 months	44.77 ± 6.725	50.20 ± 6.46	0.08
After 3 months	50.80 ± 6.35	57.14 ± 7.27	0.005

Tab. 5- Mean IKDC scores at follow-ups between the two groups

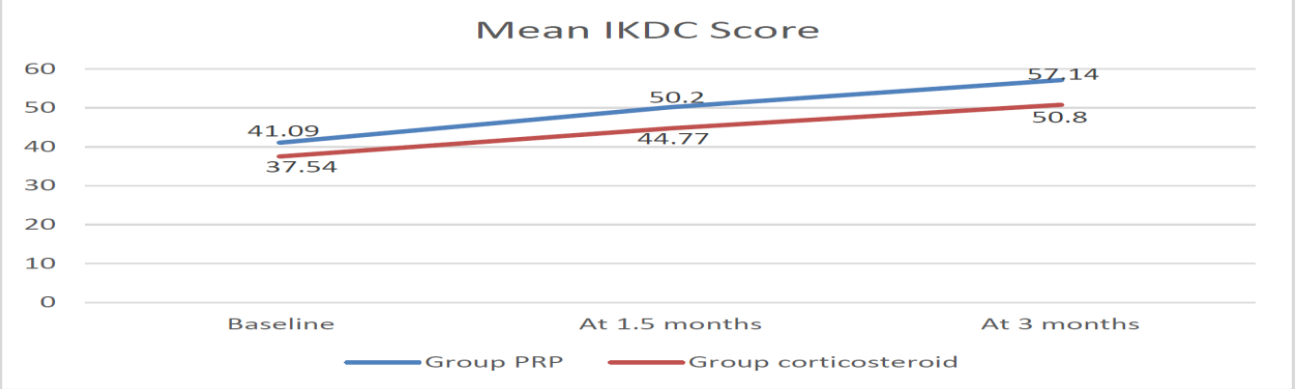


Fig. 5- Mean IKDC scores at follow-ups between the two groups

Result- The baseline mean IKDC score in the group PRP was 41.09 with a standard deviation of 6.41, while that in group corticosteroid mean was 37.54 with SD of 6.405. Both the groups were comparable with respect to baseline IKDC score (p value =0.51). The mean IKDC score at 1.5 months follow-up in the group PRP was 50.20 with SD of 6.46, whereas that in the group corticosteroid mean was 44.77 with SD of 6.725. AT 1.5 months follow-up, the IKDC score in the group PRP was significantly changed when compared to the group corticosteroid (p value = 0.08). AT 3 months follow-up, the mean IKDC score in group PRP was 57.14 with SD of 7.27, while that in group corticosteroid mean was 50.80 with SD of 6.35 with high statistical significance (p value = 0.005). Within both the groups also, there were significantly difference in score when compared to their baseline value (p value = 0.005).

Mean WOMAC scale follow-ups between steroid and PRP patients

WOMAC Score	Group Corticosteroid (Mean ± SD)	Group PRP (Mean ± SD)	P Value
Before	46.90 ± 6.17	51.76 ±5.75	0.008
After 1.5 months	53.45 ± 6.70	59.55 ±6.77	0.004
After 3 months	58.44 ± 7.02	66.19 ±6.91	0.001

Tab. 5- Mean WOMAC scores at follow-ups between the two groups

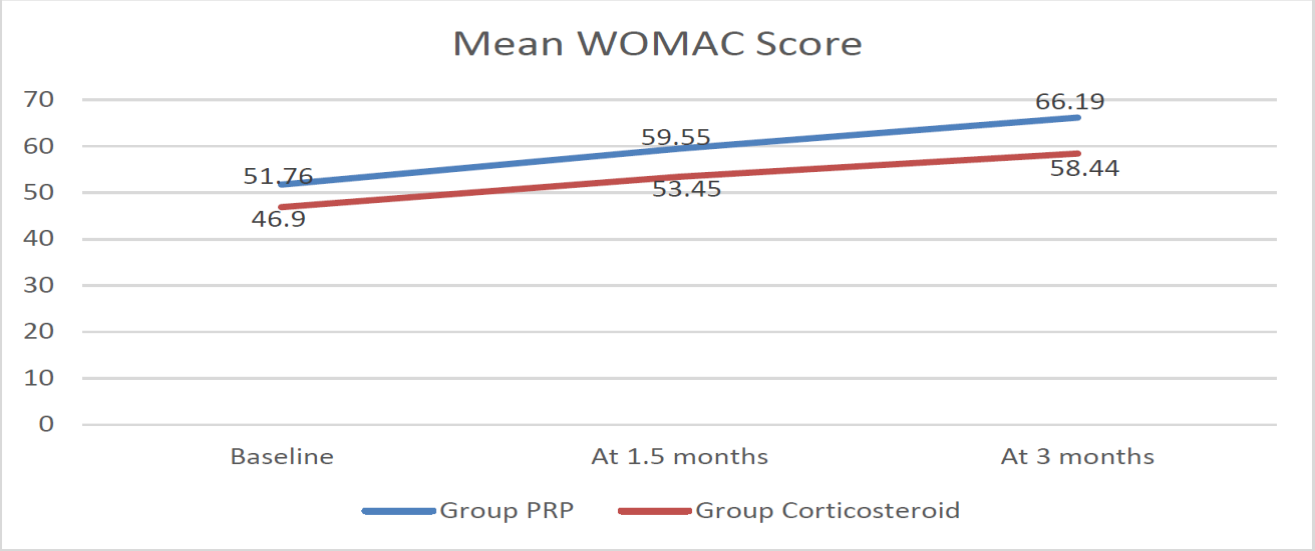


Fig. 5- Mean WOMAC scores at follow-ups between the two groups

Result- The baseline mean WOMAC score in the group PRP was 51.76 with a standard deviation of 5.75, while that in group corticosteroid mean was 46.90 with SD of 6.17. Both the groups were comparable with respect to baseline IKDC score (p value = 0.008). The mean WOMAC score at 1.5 months follow-up in the group PRP was 59.55 with SD of 6.77, whereas that in the group corticosteroid mean was 53.45 with SD of 6.70. At 1.5 months follow-up, the WOMAC score in the group PRP was significantly changed when compared to the group corticosteroid (p value = 0.004). At 3 months follow-up, the mean WOMAC score in group PRP was 66.19 with SD of 6.91, while that in group corticosteroid mean was 58.44 with SD of 7.02 with high statistical significance (p value = 0.001). Within both the groups also, there were significantly difference in score when compared to their baseline values (p values = 0.008).

Conclusion

The study found that both corticosteroids and PRP intraarticular injections provided relief from joint pain and improved joint function. However, after a three-month comparison of the effectiveness of local anaesthetic injections of PRP and steroid for treating knee osteoarthritis, the results suggest that PRP may be more effective in improving knee function and alleviating knee pain. PRP was also observed to induce mild synovitis within the first week of administration, but without any harm to the patient. To further evaluate the efficacy of PRP treatment in patients with mild to moderate OA, it is recommended that a larger trial be conducted.

Acknowledgments

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Conflicts of Interest: Nil

Ethical Approval

Ethical approval was obtained from the ethical committee, NIMS Hospital and NIMS university, Jaipur, Rajasthan, (NIMSUR/IEC/2022/215; Dated: 26/03/22)

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