

Efficacy of Intra Articular Steroid Injection and Platelet Rich Plasma in Patients with Osteoarthritis

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Author's Contribution

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ABSTRACT

Objective: To compare the efficacy of intra-articular steroid injection and Platelet rich plasma in patients with Osteoarthritis.

Methodology: A randomized controlled trail study was conducted at Rheumatology Division of the Department of Medicine, Pakistan Institute of Medical Sciences, Islamabad after the acceptance of synopsis from December 2017 to May 2018. A total of 122 adult patients with unilateral or bilateral osteoarthritis of knee and were randomized into two treatment groups. In Group I, patients received intra-articular steroid injections and in Group II, patients received platelet rich plasma (PRP). WOMAC score was calculated at baseline and was subsequently assessed after 06 weeks and 3 months.

Results: Age and gender distribution and mean WOMAC and VAS scores were similar in both groups at baseline ($p > 0.05$). At six weeks, mean WOMAC score in steroid group was 32.1 ± 24.1 and it was 24.9 ± 21.3 in PRP group ($P = 0.084$). Mean VAS in steroid group was 4.5 ± 2.5 and it was 3.9 ± 2.6 in PRP group ($P = 0.0158$). At three months, mean WOMAC score in steroid group was 39.1 ± 24.3 SD and it was 27.1 ± 21.9 SD in PRP group ($P = 0.005$). At three months, mean VAS in steroid group was 5.6 ± 2.6 and it was 4.1 ± 2.7 in PRP group ($P = 0.003$).

Conclusions: The study outcomes were better in patients treated with PRP as compared to intra-articular steroid injection. Mean WMOAC and VAS scores were significantly lower after three months in PRP group as compared to steroid group.

Keywords: Intra-articular steroids, Osteoarthritis, Platelet rich plasma.

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Introduction

Platelets can promote cellular proliferation, vascularization, tissue regeneration, and collagen formation. PRP is thought to help tendon and cartilage tissue regeneration by delivering high quantities of cytokines and growth factors to injured areas.

Osteoarthritis (OA) is a major cause of chronic impairment globally and is one of the most prevalent articular cartilage diseases. According to estimates, 16.7% of adults over the age of 45 have symptomatic knee OA, with 27.8% having radiographic indications of cartilage deterioration.¹

Patients of knee osteoarthritis have compromised quality of life due to the negative impact of OA, which is a common chronic disease of joints. Most common clinical signs include pain and loss of function, which require treatment. In patients with severe knee OA, an effective treatment option is knee replacement surgery. In younger and middle-aged people presenting with early stage OA, non-surgical conservative techniques are recommended.²

Non-steroid and steroid anti-inflammatory medicines, analgesics and hyaluronic acid injections are nonsurgical alternatives. These alternatives have been proved to be beneficial in the short term, but these medicines have not provided any evidence to limit the progression of OA.³

Walking, weight loss, exercise, local cooling and heating, sole modification, and shoe therapy, among other non-pharmacological modalities, are effective in improving OA. Pharmacologic therapies include paracetamol, nonsteroidal anti-inflammatory drugs, opioids, and slow-acting pharmaceuticals (glucosamine and chondroitin sulfate). If orally taken medications are ineffectual, intraarticular injection (corticosteroids, viscosupplements, blood-derived products) is a non-operative option.^{4,5}

Corticosteroids contain anti-inflammatory as well as immunosuppressive properties, but their mechanism of action is complicated. The adrenal cortex produces steroid hormones called corticosteroids, which include glucocorticoids and mineralocorticoids. Many biological functions are directly linked with glucocorticoids, like homeostasis, development, metabolism, inflammation, and cognition.⁶ Glucocorticoids are among most frequently prescribed drugs globally due to powerful immune-modulating characteristics. Glucocorticoids have become a standard treatment for a wide range of inflammatory and autoimmune illnesses. Unfortunately, glucocorticoids' therapeutic advantages are restricted by the negative side effects that come with high doses and long-term use. Most commonly observed side effects are skin atrophy, diabetes mellitus, osteoporosis, glaucoma, avascular necrosis, abdominal obesity, growth retardation infection and hypertension.^{7,8}

Platelet-rich plasma (PRP), a biological therapy, has lately emerged as an exciting treatment option for patients with OA to enhance joint health.⁹ PRP (platelet-rich plasma) is an autologous concentration of a large number of platelets in a short amount of plasma obtained by centrifuging blood.¹⁰ There is a scarcity of local evidence on the use of PRP and its efficacy. This study was designed to determine and compare the efficacy of platelet rich plasma injection against Intra Articular Steroid Injection in patients with knee osteoarthritis,

Methodology

This randomized controlled experiment was carried out at the Pakistan Institute of Medical Sciences' Department of Rheumatology in Islamabad. Written informed consent was obtained from each participant / close relative after approval from the Shaheed Zulfiqar Ali Bhutto Medical University's ethical review board (ERB).

A total of 122 patients were selected by non-probability consecutive sampling and were divided into two groups

of 61 patients in each group randomly by lottery method. Sample size was calculated by using WHO sample size calculator was used to calculate the sample size using a 5% level of significance, an 80 % power of test, a population standard deviation of 15, Test value of population mean WOMAC score for PRP group 53.20, and Population mean WOMAC score of 45.54 for control group.¹¹

Patients having age between 30-70 years, Cases of unilateral or bilateral early Osteoarthritis and having Kellgren and Lawrence Grade 0 to Grade III Osteoarthritis were selected for the study. Patients with OA secondary to joint inflammatory diseases, metabolic disease of bone, advanced stages of OA, who have received intra articular injections within 03 months or who are receiving anti-coagulant therapy, having Hemoglobin of less than 10 mg/dl or associated infection, tumor, crystal arthropathies or tense joint effusions, taking NSAIDs and Patients on strong analgesics e.g. morphine, codeine etc were excluded from the study.

The procedure was performed with a sterile disposable syringe under full aseptic measure. The procedure was performed by a consultant rheumatologist who was assisted by the researcher. One group of patients was given intra-articular steroid injections and one group was given PRP. Patients were then followed one and three months of injection in rheumatology OPD. Each patient was assessed on a WOMAC score at baseline and then at one and 3 months after the injections. All data was independently recorded on a custom developed Performa for each case and double-checked by a specialist.

SPSS V.20 was used to enter and evaluate the data. For quantitative data such as age and WOMAC score, mean and standard deviation were calculated. Frequency and percentages were presented for qualitative variables like gender etc. Mean WOMAC score was compared in both groups at different time intervals by applying independent sample t-test. P-value <0.05 was considered significant.

Results

The gender distribution was similar in both groups. There were 32 (52.5%) males and 29 (47.5%) females in group I and 34 (55.7%) males and 27 (44.3%) females in group II. The mean age of the patients in steroid group was 56.8±11.2 years and in PRP group it was 55.8±10.5 years without any statistically significant difference between both groups as elaborated in table I.

Table I: Distribution of demographic characteristics of the patients

Characteristics	Group		Total
	Steroids	PRP	
Distribution of gender			
Males	32 52.50%	34 55.70%	66 54.10%
Females	29 47.50%	27 44.30%	56 45.90%
Total	61 100.00%	61 100.00%	122 100.00%
Age of the patients (years)			
Mean \pm SD	56.8 \pm 11.2	55.8 \pm 10.5	P>0.05

Outcome of treatment was assessed at six weeks and three months. Mean baseline VAS score was similar in both groups with a mean value of 7.8 ± 1.4 in group I and mean value of 7.5 ± 1.3 in group II having a (P-value of 0.252). Mean VAS score in steroid group was 4.5 ± 2.5 and it was 3.9 ± 2.6 in PRP group. Mean VAS at six weeks was lower in PRP group, however, the difference was not statistically significant (P=0.0158). At three months, mean VAS score in steroid group was 5.6 ± 2.6 and it was 4.1 ± 2.7 in PRP group. Mean value of VAS at three months was significantly lower in PRP group in comparison to steroid group (P=0.003) as shown in table II.

Table II: Comparison of VAS scores at baseline, 6 weeks, and 3 months between both groups.

	Group		P-Value
	Steroids	PRP	
VAS Score at Base line			
	7.8 \pm 1.4	7.5 \pm 1.3	0.252
VAS Score at 6 Weeks			
	4.5 \pm 2.5	3.9 \pm 2.6	0.158
VAS Score at 3 Months			
	5.6 \pm 2.6	4.1 \pm 2.7	0.003

Mean baseline WOMAC score was similar in both groups with mean value of 60.1 ± 16.1 in group I and its mean value was 56.4 ± 18.3 in group II (p=0.238). At six weeks, mean WOMAC score in steroid group was 32.1 ± 24.1 and it was 24.9 ± 21.3 in PRP group. Mean WOMAC score at six weeks was lower in PRP group, however, the difference was not statistically significant (P=0.084). At three months, mean WOMAC score in steroid group was 39.1 ± 24.3 and it was 27.1 ± 21.9 in PRP group. Mean WOMAC score at three months was significantly lower in PRP group as compared to steroid group (P=0.005) as elaborated in table III.

Table III: Comparison of WOMAC scores at baseline, 6 weeks, and 3 months between both groups

	Group		P-Value
	Steroids	PRP	
WOMAC Score at Base line			
	60.1 \pm 16.1	56.4 \pm 18.2	0.238
WOMAC Score at 6 Weeks			
	32.1 \pm 24.1	24.9 \pm 21.3	0.084
WOMAC Score at 3 Months			
	39.1 \pm 24.3	27.1 \pm 21.9	0.005

Discussion

Osteoarthritis is a "complex joint" disease. It is not a "wear and tear" disease, as one thought. It involves inflammatory mediators. Degeneration of cartilages, synovitis, subchondral bone remodeling, degeneration of ligaments and menisci, and hypertrophy of the joint capsule are all part of the aetiology. Intra-articular steroid injections can help with short-term discomfort and can be used as a supplement to other treatments. Hyaluronic acid injections into the joints may also provide pain relief, but they are not cost-effective. Intra-articular injections of PRP have also shown promise, particularly in younger patients.¹²

In OA, inflammation and cartilage degradation leads to release of several inflammatory mediators and sensitize primary afferent nerve fibers. The mechanisms of action of corticosteroids and PRP are not the same. Corticosteroids are anti-inflammatory as well as immunosuppressive. They work by interfering with the inflammatory and immunological systems by acting on nuclear steroid receptors. Steroids decrease vascular permeability and limit the accumulation of inflammatory cells in this way. They also stop the production of inflammatory mediators such as prostaglandins and leukotrienes.¹³ Concentrate of platelets is generally activated by adding calcium chloride, which results in a formation of platelet gel and release of various growth factors (GFs). Thus, PRP promote healing process by delivering these GFs (insulin-like growth factor, transforming growth factor- β , platelet derived growth factor, etc) and some other active molecules (arachidonic acid metabolites nucleotides, ascorbic acid, cytokines, chemokines etc) to the injured site. Chondrogenesis, bone remodelling, proliferation, angiogenesis, anti-inflammation, coagulation, and cell differentiation are all aided by these factors.¹⁴

Several studies have demonstrated the efficacy of PRP for treating OA. Forogh B, et al in their RCT on patients with Knee OA compared the efficacy of intra-articular injection of PRP and corticosteroids. Patients in PRP group had significantly higher pain relief with better daily activities and symptom - free routines in comparison to corticosteroid group.¹⁵

The usage of PRP has been expanded recently to include the treatment of a variety of musculoskeletal injuries. Because of the physiological significance of various bioactive proteins and growth factors expressed in platelets, which contributes to tissue regeneration, PRP was created for treatment in patients with OA. Despite differences in technique and formulation, intra-articular PRP injection has been shown to be successful for treating degenerative knees in multiple investigations.¹⁶ The results of present study also showed that the PRP injection group had a significantly lower pain score based on VAS (5.6 ± 2.6 vs. 4.1 ± 2.7 , P-value = 0.003) and WOMAC scores (39.1 ± 24.3 vs 27.1 ± 21.9 , P-value = 0.005) after 3 months. These findings are quite similar to those of prior investigations. PRP treatment for knee OA has been shown in multiple studies to improve patient results. In individuals with knee OA, the PRP treatment had a good effect. Pain reduction, better symptoms, and improved quality of life were observed in both operated and non-operated patients.^{17,18} Intra-articular injection of platelet rich plasma was found to be an effective treatment option in comparison to intra-articular steroid injections in patients with osteoarthritis. The duration of follow up in this study was relatively shorter as the WOMAC score started declining at six weeks. We suggest further studies with a longer duration of follow-up.

Conclusion

The results of our study show that study outcomes were better in patients treated with PRP as compared to intra-articular steroid injection in patients with established osteoarthritis. Mean WOMAC score and mean VAS was lower at six weeks and three months in PRP group when compared with steroid group. The difference was however, not significant at six weeks but became significant at three months after therapy.

References

1. Belk JW, Kraeutler MJ, Houck DA, Goodrich JA, Drago JL, McCarty EC. Platelet-Rich Plasma Versus Hyaluronic Acid for Knee Osteoarthritis: A Systematic Review and Meta-

analysis of Randomized Controlled Trials. *Am J Sports Med.* 2021;49(1):249-60.

<https://doi.org/10.1177/0363546520909397>

2. Johnson VL, Hunter DJ. The epidemiology of osteoarthritis. *Best Pract Res Clin Rheumatol* 2014;28:5-15. <https://doi.org/10.1016/j.berh.2014.01.004>
3. Dai WL, Zhou AG, Zhang H, Zhang J. Efficacy of Platelet-Rich Plasma in the Treatment of Knee Osteoarthritis: A Meta-analysis of Randomized Controlled Trials. *Arthroscop.* 2017;33(3):659-70. <https://doi.org/10.1016/j.arthro.2016.09.024>
4. DiRenzo D, Finan P. Self-Efficacy and the Role of Non-Pharmacologic Treatment Strategies to Improve Pain and Affect in Arthritis. *Curr Treatm Opt Rheumatol.* 2019;5:168-78. <https://doi.org/10.1007/s40674-019-00123-z>
5. Baxi SS, Nicole F, Patel MR. Pharmacologic Management of Rheumatoid Arthritis. *Orthopaedic Nursing:* 2019;38(6):390-5. <https://doi.org/10.1097/NOR.0000000000000610>
6. Ramamoorthy S, Cidowski JA. Corticosteroids: Mechanisms of Action in Health and Disease. *Rheum Dis Clin North Am.* 2016;42(1):15-31. <https://doi.org/10.1016/j.rdc.2015.08.002>
7. Van Moortel L, Gevaert K, De Bosscher K. Improved Glucocorticoid Receptor Ligands: Fantastic Beasts, but How to Find Them? *Front Endocrinol.* 2020;11:559673. <https://doi.org/10.3389/fendo.2020.559673>
8. Kijowski R. Risks and benefits of intra-articular corticosteroid injection for treatment of osteoarthritis: what radiologists and patients need to know? *Radiol.* 2019;293:664-5. <https://doi.org/10.1148/radiol.2019192034>
9. Glynn LG, Mustafa A, Casey M, Krawczyk J, Blom J, Galvin R. Platelet-rich plasma (PRP) therapy for knee arthritis: a feasibility study in primary care. *Pilot Feasibility Stud.* 2018;4:93. <https://doi.org/10.1186/s40814-018-0288-2>
10. Cugat R, Cusco X, Seijas R, et al. Biologic enhancement of cartilage repair: The role of platelet-rich plasma and other commercially available growth factors. *Arthroscop* 2015;31:777-83. <https://doi.org/10.1016/j.arthro.2014.11.031>
11. Patel S, Dhillon MS, Aggarwal S, Marwaha N, Jain A. Treatment with platelet-rich plasma is more effective than placebo for knee osteoarthritis a prospective, double-blind, randomized trial. *Am J Sports Med.* 2013;41(2):356-64. <https://doi.org/10.1177/0363546512471299>
12. McGrory B, Weber K, Lynott JA, Richmond JC, Davis CM 3rd, Yates A Jr, et al. American Academy of Orthopaedic Surgeons. The American Academy of Orthopaedic Surgeons Evidence-Based Clinical Practice Guideline on Surgical Management of Osteoarthritis of the Knee. *J Bone Joint Surg Am.* 2016;98(8):688-92. <https://doi.org/10.2106/JBJS.15.01311>
13. Neogi T. The epidemiology and impact of pain in osteoarthritis. *Osteoarthritis and Cartilage.*

- 2013;21(9):1145-53.
<https://doi.org/10.1016/j.joca.2013.03.018>
14. Jevsevar DS, Brown GA, Jones DL, Matzkin EG, Manner PA, Mooar P, et al. The American Academy of Orthopaedic Surgeons evidence-based guideline. *J Bone Joint Surg.* 2013;95(20):1885-6.
<https://doi.org/10.2106/00004623-201310160-00010>
 15. Forogh B, Mianehsaz E, Shoaee S, Ahadi T, Raissi GR, Sajadi S. Effect of single injection of platelet-rich plasma in comparison with corticosteroid on knee osteoarthritis: a double-blind randomized clinical trial. *J Sports Med Phys Fitness.* 2016;56(7-8):901-8.
 16. Meheux CJ, McCulloch PC, Lintner DM, Varner KE, Harris JD. Efficacy of intra-articular platelet-rich plasma injections in knee osteoarthritis: A systematic review. *Arthroscop.* 2016;32:495-505.
<https://doi.org/10.1016/j.arthro.2015.08.005>
 17. Zhao J, Huang H, Liang G, Zeng LF, Yang W, Liu J. Effects and safety of the combination of platelet-rich plasma (PRP) and hyaluronic acid (HA) in the treatment of knee osteoarthritis: a systematic review and meta-analysis. *BMC Musculoskelet Disord.* 2020;21(1):224.
<https://doi.org/10.1186/s12891-020-03262-w>
 18. Tan J, Chen H, Zhao L, Huang W. Platelet-Rich Plasma Versus Hyaluronic Acid in the Treatment of Knee Osteoarthritis: A Meta-analysis of 26 Randomized Controlled Trials. *Arthroscop.* 2021;37(1):309-25.
<https://doi.org/10.1016/j.arthro.2020.07.011>