Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Orthopaedics Surgery

Journal homepage: https://www.ijos.co.in/

Original Research Article

Efficacy of intra-articular platelet -rich plasma in osteoarthritis knee

Saurabh Suman[1]*, **Gaurav Vatsa**[1], **Kumar Anshuman**[1]

[1] *Dept. of Orthopaedics, Narayan Medical College and Hospital, Sasaram, Bihar, india*

ARTICLE INFO

Article history:
Received 10-01-2024
Accepted 05-02-2024
Available online 04-03-2024

Keywords:
Knee osteoarthritis
Intra-articular PRP injections
Prospective randomised controlled trial
WOMAC scores
Visual analog scale
Pain management
Physical function improvement

ABSTRACT

Background: Knee osteoarthritis is prevalent globally among the aged adults with an ageing and increasingly obese population. It is also the second leading cause of disability and a heavy economic and social burden. The aim of this study is to analyse the efficacy of intra articular PRP injections in knee osteoarthritis.

Materials and Methods: This study is a prospective randomised controlled trial with duration of 6 months upon a sample size of 50 people with a diagnosis of Knee Osteoarthritis in which 2 injections of PRP were given 4 weeks apart and its result was analysed at 3 months and compared with initial pre-administration levels.

Results: In a study with 50 participants (50% males, mean age 59.02 years), intra-articular PRP injections showed significant improvement in WOMAC scores for pain (75.5% to 41.1%), stiffness (84.5% to 57.5%), and physical function (46.2% to 78.2%) at 3 months. No side effects were reported. Visual Analog scale indicated a notable decrease in pain (7.44 to 4.8).

Conclusion: In conclusion, the administration of PRP injections showed substantial decrease in pain and other associated symptoms and an increase in physical function.

1. Introduction

It is crucial to address knee osteoarthritis (OA), a prevalent condition among aging individuals globally, exacerbated by the rise in obesity. Ranking as the second leading cause of disability, OA imposes significant economic and social burdens. Patients typically encounter symptoms such as pain, swelling, stiffness, and restricted motion. Management strategies encompass conservative measures like patient education, weight loss, exercise, and the use of pain medications, as well as intra-articular interventions like hyaluronan, glucosamine, or chondroitin. In cases where OA progresses to an advanced stage, joint replacement surgery, specifically arthroplasty, becomes a clinically relevant option. However, for this procedure to be considered cost-effective, it is essential to limit its application to patients with a severely compromised functional status. This emphasizes the importance of tailoring treatments to the specific needs and conditions of individuals affected by knee osteoarthritis. [1,2]

Oral NSAIDs prove effective in providing clinically significant improvement in both pain management and enhanced functionality for individuals with knee osteoarthritis. In cases where patients do not respond adequately to oral or topical analgesics, intra-articular corticosteroids are recommended as an alternative. Additionally, the clinical efficacy of intra-articular hyaluronic acid (HA) injections stands out, offering beneficial effects in alleviating pain, improving overall function, and positively influencing global patient assessments in the context of treating osteoarthritis of

* *Corresponding author*.
E-mail address: saurabhsuman295@gmail.com (S. Suman).

https://doi.org/10.18231/j.ijos.2024.003

the knee.[1,3] These treatment modalities contribute to a comprehensive approach in managing knee osteoarthritis, considering both oral and localized interventions based on individual patient responses and needs.

The use of platelet-rich plasma (PRP) in the context of osteoarthritis treatment has garnered attention for its potential to modify the course of the disease. Its simplicity and cost-effectiveness, coupled with the minimally invasive nature of intra-articular injection, make PRP an appealing therapeutic option. The concentrated growth factors present in PRP contribute to tissue regeneration, offering a natural and autologous approach to enhance healing.[4]

In addition to its regenerative properties, PRP stands out for its anti-inflammatory effects. The release of interleukin-1ra, a key anti-inflammatory signal, positions PRP as a promising avenue for addressing the inflammatory component of osteoarthritis. This dual action, promoting both tissue repair and reducing inflammation, underscores the multifaceted potential of PRP in managing knee osteoarthritis.[5]

Moreover, the cost-effectiveness of platelet concentrates is a notable advantage. The straightforward process of obtaining PRP through centrifugation, utilizing the patient's own blood, contributes to its economic appeal. This makes PRP an accessible and patient-friendly option for those seeking alternatives to traditional osteoarthritis treatments.[6]

As research continues to unfold, the versatility and regenerative capabilities of PRP hold promise for advancing the landscape of knee osteoarthritis management. The combination of being a patient-friendly, cost-effective, and minimally invasive option makes PRP a compelling therapeutic strategy in the quest for effective osteoarthritis interventions.[7]

2. Aim

The present study aims to study the efficacy of intra articular PRP injections in knee osteoarthritis.

3. Objectives

1. To assess the pain relief efficacy
2. To measure functional improvement in knee range of movement
3. To examine structural changes in knee

4. Methodology

All patients of either sex visiting NMCH, Sasaram who met a predefined inclusion and exclusion criteria were chosen as cited below:

1. Study design: Prospective randomised controlled trial.
2. Place of study: NMCH, Sasaram.
3. Duration of study: 6 months.
4. Sample size: 50 people with a diagnosis of Knee Osteoarthritis.

4.1. Inclusion criteria

1. Patients with knee OA (based on American College of Rheumatology criteria)
2. Age: 40-70 years
3. Symptom duration > 3 months
4. Confirmatory X-ray diagnosis (Kellgren-Lawrence grade 1-4) within the past 3 months.

4.2. Exclusion criteria

1. Known case of diabetes mellitus, immunodeficiency and collagen vascular disorders.
2. History or presence of malignant disorders, infection or active wound in the knee area, recent history of severe trauma to the knee.
3. Autoimmune and platelet disorders, treatment with anticoagulant and antiplatelet medications 10 days before injection.
4. Use of NSAIDs 2 days before injection, history of knee intraarticular injections of corticosteroids during the past 3 weeks or use of systemic corticosteroids 2 weeks before PRP injections.

All the participants who signed the written consent form were included in the study. Then study participants were attended in a screening visit (visit 1) that included history taking, physical examination, laboratory testing (complete blood count with differential (CBC diff), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP)), knee radiography (standing Anterior-posterior (AP) and lateral views), and survey of used medications and supplements. For the process of PRP preparation and injection, participant's 35-40 mL of blood was first collected from the upper limb cubital vein using an 18G needle. The blood sample was then centrifuged. The final product i.e 4-6 mL of PRP containing leukocytes was injected in a sterile condition using a 22G needle through the classical approach for intra-articular injection (lateral mid-patellar in extended knee position or anteromedial in flexed knee position). The second injection was administered 28 days (4 weeks) after the first injection with the same conditions. Then the functional outcome was measured for all the participants initially before the administration of PRP injection followed by measuring the same at 3 months after initial injection using WOMAC scoring system and VAS and compared with each other.

5. Results

The number of males in this study were 25/50(50.0%) while the number of females were 25/50(50.0%). The mean age of the participants was 59.02 years (Males – 60.44

years and females – 57.6 years). The results were analysed using WOMAC scoring system and VAS by comparing the initial score before instillation of PRP injections with the score measured at 3 months follow up from the date of 1^{st} injection. The WOMAC score is divided into three segments – pain (0-20), stiffness (0-8) and physical function (0-68). Overall, the minimum score possible was 0 and the maximum score possible was 96 as per this scoring system.

The mean WOMAC scores before instillation of PRP were 15.1/20(75.5%) for pain, 6.76/8(84.5%) for stiffness and 31.42/68(46.2%) for physical function. The mean WOMAC scores measured at 3 months after 1^{st} injection of intra-articular PRP injection denoted the scores of 8.22/20 (41.1%) for pain, 4.6/8(57.5%) for stiffness and 53.2/68(78.2%) for physical function. The overall WOMAC score for the 1^{st} group was 53.28/96 (55.5%) while it was 66.02/96 (68.7%) for the 2^{nd} group. Apart from this no side effects were noted in the study which was a big positive. As per the Visual Analog Scale, the initial mean reading was 7.44 and the reading upon the visit at 3 months was found to be 4.8 which was a considerable decrease in terms of pain.

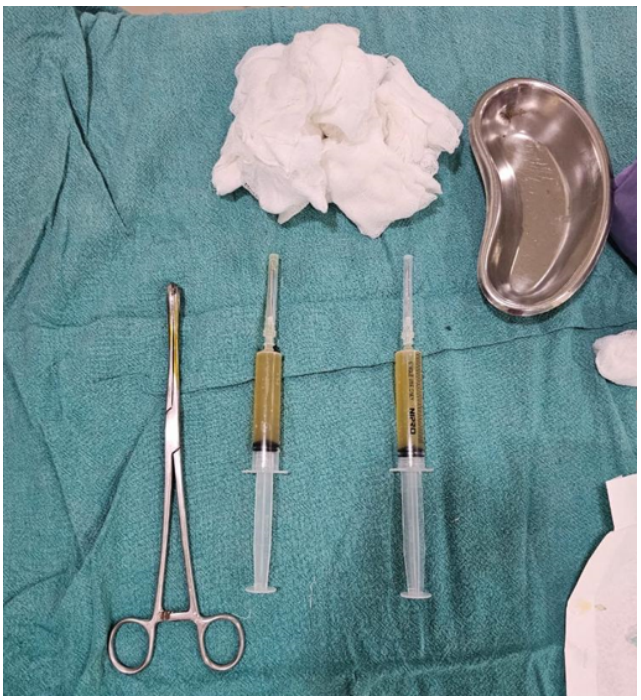


Figure 1: PRP sample with equipments for use

6. Discussion

As clearly demonstrated in the results, administration of two doses of intra-articular PRP injection have shown significant decrease in pain (34.4%) and stiffness (27.0%). It has also shown a remarkable increase in the physical activity parameter (32.0%). As compared to use of intra-articular steroids where local or sometimes systemic side effects may be noted, no such side effects were noted in this study. Along with it, a remarkable decrease of 2.64 points were noted as per the visual analogue scale. Hence, it can clearly be stated that the administration intra-articular platelet rich plasma is highly efficacious in osteoarthritis knee.

Table 1: American college of rheumatology criteria for knee osteoarthritis

Clinical and laboratory	**Clinical and radiographic**
Knee pain + at least 5 of 9	Knee pain + osteophytes on radiography + at least 1 of 3.
Age >50 yrs	Age >50 yrs
Stiffness <30 mins	Stiffness <30 mins
Crepitus	Crepitus
Bony tenderness	
Bony enlargement	
No palpable growth	
ESR <40mm/hr	
RF <1:40	
White blood cell count < 2000/mm3	

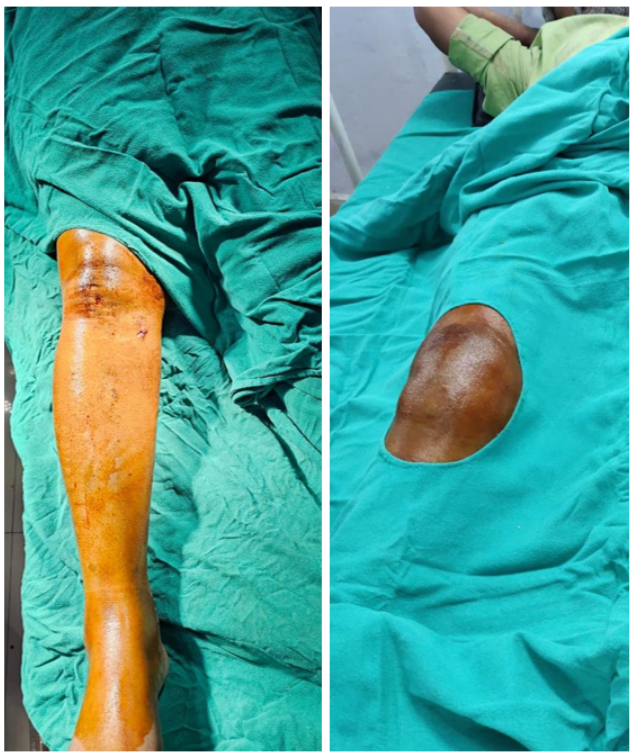


Figure 2: Part cleaned and draped

Table 2: Kellgren-lawrence grading

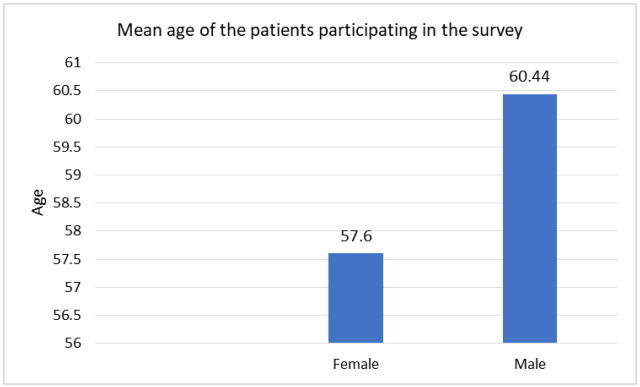
Classification	**Normal**	**Doubtful**	**Mild**	**Moderate**	**Severe**
Grade	0	1	2	3	4
Description	No features of OA	Minute osteophyte: doubtful significance	Definite osteophyte: normal joint space	Moderate joint space reduction	Joint space greatly reduced: subchondral sclerosis

Table 3: Statistical analysis of pre and post injection VAS and WOMAC scores

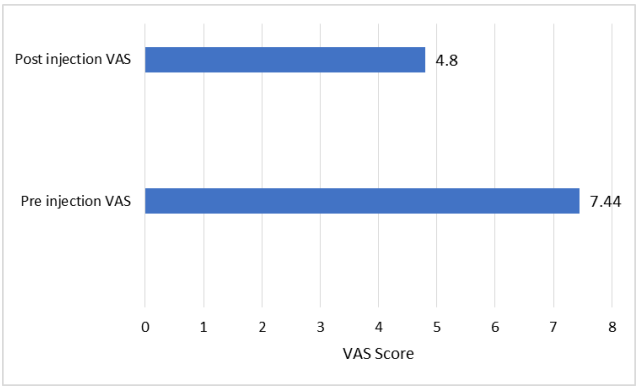
	Mean	**Standard Deviation**	**p Value**
Pre injection VAS	7.4	1.293626448	$1.7x10^{-19}$
Post injection VAS	4.78	1.035886685	
Pre injection WOMAC	53.02	5.437924274	$5.87x10^{-22}$
Post injection WOMAC	65.9	4.994895353	

Table 4: WOMAC score format

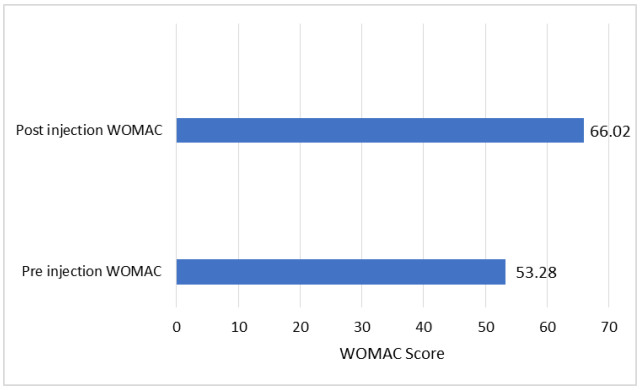
Pain	Walking on flat surface	0	1	2	3	4
	Walking up and down stairs	0	1	2	3	4
	Sleeping	0	1	2	3	4
	Sitting or lying	0	1	2	3	4
	Sanding	0	1	2	3	4
Stiffness	At first walking	0	1	2	3	4
	Later in the day	0	1	2	3	4
Physical function	Going up stairs	0	1	2	3	4
	Rising from sitting	0	1	2	3	4
	Standing	0	1	2	3	4
	Bending down	0	1	2	3	4
	Walking on a flat surface	0	1	2	3	4
	Getting into/out of the car	0		2	3	4
	Going shopping	0	1	2	3	4
	Putting on socks or tights	0	1	2	3	4
	Taking off socks or tights	0	1	2	3	4
	Getting out of bed	0	1	2	3	4
	Lying in bed	0	1	2	3	4
	Getting into/out of bath	0	1	2	3	4
	Sitting	0	1	2	3	4
	Getting onto/off the toilet	0	1	2	3	4
	Doing heavy domestic duties	0	1	2	3	4
	Doing light domestic duties	0	1	2	3	4



Graph 1: Mean age of the patients participating in the survey



Graph 2: Comparison of VAS scores before and after PRP injection



Graph 3: Comparison of WOMAC scores before and after PRP injection

7. Conclusion

This prospective randomized trial represents a significant endeavor to investigate the effectiveness of platelet-rich plasma (PRP) in addressing the challenges posed by knee osteoarthritis. While acknowledging the inherent limitations in the study size and duration, it is crucial to highlight the profound impact that PRP might have on patients dealing with this debilitating condition. The preliminary findings strongly suggest a noteworthy alleviation of pain and stiffness in the knee joint, coupled with a discernible improvement in physical activity levels among the study participants.

Although the constraints in terms of study size and duration warrant caution in drawing definitive conclusions, the compelling evidence of PRP's positive effects on knee osteoarthritis cannot be overlooked. The observed reduction in pain and improvement in joint function offer promising insights into the potential benefits of PRP therapy.

By recognizing the limitations of this study, such as its sample size and duration, the results should be viewed as a stepping stone towards building a comprehensive understanding of PRP's efficacy in knee osteoarthritis treatment. The demonstrated positive outcomes, however, open avenues for future research endeavors with larger cohorts and extended follow-up periods, aiming to refine our understanding of the long-term impact and sustainability of PRP interventions.

In light of the encouraging outcomes observed in this trial, these findings can serve as a valuable foundation for evidence-based recommendations regarding the incorporation of PRP injections into the treatment paradigm for knee osteoarthritis. The tangible benefits witnessed in terms of pain reduction, increased joint mobility, and enhanced physical activity levels underscore the potential of PRP as a viable therapeutic approach. This information not only contributes to the ongoing discourse in the medical community but also offers clinicians a basis for informed decision-making when considering PRP as a treatment option for patients grappling with knee osteoarthritis.

8. Source of Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

9. Conflicts of Interest

The authors, Dr. Saurabh Suman, Dr. Gaurav Vatsa, and Prof. Dr. Kumar Anshuman, declare no conflicts of interest related to this study. There were no financial or personal relationships with individuals or organizations that could potentially bias the research.

10. Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available due to patient confidentiality concerns but are available from the corresponding author on reasonable request.

11. Acknowledgement

We gratefully acknowledge the outstanding contributions of all members of the project, members of the department, members of the institute ethics committee and the members of the evaluation team without whom this project could not have been accomplished.

Special acknowledgement for outstanding leadership and tireless efforts accorded to Dr. Kumar Anshuman, Prof.& Head, Department of Orthopaedics, Narayan Medical College and Hospital, Sasaram. His leadership enabled the project to be conducted in accordance with the highest standards of excellence possible. Special appreciation is extended to Dr. Gaurav Vatsa, 3^{rd} year post graduate resident, Department of Orthopaedics, Narayan Medical College and Hospital, Sasaram, who has performed in an exemplary manner and contributed invaluably to this project. The input, insight and energy from these individuals helped launch this project and their dedication and devotion have helped through its successful completion.

This was a completely non-funded project undertaken at our own expense and no funding has been taken from any individual or source or department or organisations. The total expense of this project has been borne by the project members in its entirety.

It should also been known that neither the members of this project nor this study in its complete sense pertains any conflict of interest.

The views expressed in the article contained in this Supplement are strictly those of the authors. No official support or endorsement by any organisation or government agency or any of its components is intended, nor should it be inferred.

References

1. Hunter DJ, Bierma-Zeinstra S. Osteoarthritis. *Lancet*. 2019;393(10182):1745–59.
2. Zhang HF, Wang CG, Li H, Huang YT, Li ZJ. Intra-articular platelet-rich plasma versus hyaluronic acid in the treatment of knee osteoarthritis: a meta-analysis. *Drug Design Dev Ther*. 2018;12:445–53.
3. Lin K, Yang CC, Hsu CJ, Yeh ML, Renn JH. Intraarticular Injection of Platelet-Rich Plasma Is Superior to Hyaluronic Acid or Saline Solution in the Treatment of Mild to Moderate Knee Osteoarthritis: A Randomized, Double-Blind, Triple-Parallel, Placebo- Controlled Clinical Trial. *Arthroscopy*. 2019;35(1):106–17.
4. Kavadar G, Demircioglu DT, Celik MY, Emre TY. Effectiveness of platelet-rich plasma in the treatment of moderate knee osteoarthritis: a randomized prospective study. *J Phys Ther Sci*. 2015;27(12):3863–7.
5. Filardo G, Kon E, Buda R, Timoncini A, Martino AD, Cenacchi A, et al. Platelet-rich plasma intra-articular knee injections for the treatment of degenerative cartilage lesions and osteoarthritis. *Knee Surg Sports Traumatol Arthrosc*. 2011;19(4):528–35.
6. Sampson S, Reed M, Silvers H, Meng M, Mandelbaum B, et al. Injection of platelet-rich plasma in patients with primary and secondary knee osteoarthritis. *Am J Phys Med Rehabil*. 2010;89(12):961–9.
7. Simental-Mendía M, Vílchez-Cavazos JF, Peña-Martínez VM, Said-Fernández S, Lara-Arias J, Martínezrodríguez HG. Leukocyte-poor platelet-rich plasma is more effective than the conventional therapy with acetaminophen for the treatment of early knee osteoarthritis. *Arch Orthop Trauma Surg*. 2016;136(12):1723–32.

Author biography

Saurabh Suman, PG Resident https://orcid.org/0009-0009-0823-2758

Gaurav Vatsa, PG Resident https://orcid.org/0009-0005-3373-7863

Kumar Anshuman, Professor and Head https://orcid.org/0009-0004-6087-5682

Cite this article: Suman S, Vatsa G, Anshuman K. Efficacy of intra-articular platelet -rich plasma in osteoarthritis knee. *Indian J Orthop Surg* 2024;10(1):17-22.