Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v30i18.3482

PLATELET-RICH PLASMA (PRP) AND ITS PLATELET CONCENTRATION HELP ALLEVIATE OSTEOARTHRITIS SYMPTOMS: OUR HOSPITAL EXPERIENCE

Sundas Asad[1], Eslam Mohammed Shalaby[2], Niaz Hussain Keerio[3*], Zulfiqar Haider Kerawala[4], Mohammed Asif Peracha[5], Azizullah Bhayo[6]

[1]Consultant Orthopedic Surgeon, Peoples Medical College & Hospital Nawabshah Pakistan. email: Zimyad10@gmail.com
[2]Senior Specialist Orthopedic Trauma, Hatta Hospital Dubai Academic Health Corporation United Arab Emirates. email: nooreslam@yahoo.com
[3*]Assistant Professor Orthopedic, Muhammad Medical College Hospital, Ibn-e-Sina University Mirpurkhas Pakistan. email: niaz_h@hotmail.com
[4]Specialist Orthopedic Surgeon, Al Qassimi Hospital Sharjah United Arab Emirates. email: zhkerawala@gmail.com
[5]Consultant Orthopedic Surgeon, Liaquat National Hospital and Medical College Karachi Pakistan. email: drasifperacha@hotmail.com
[6]Assistant Professor Orthopedic, Ghulam Muhammad Mahar Medical College Sukkur Pakistan. email: azizbhayo@gmail.com

[*]**Corresponding Author:** Niaz Hussain Keerio
[*]Assistant Professor Orthopedic, Muhammad Medical College Hospital, Ibn-e-Sina University Mirpurkhas Pakistan. email: niaz_h@hotmail.com

ABSTRACT

Background: Osteoarthritis is a disorder that mainly affects the cartilage in synovial joints, resulting in localized damage and sclerosis of the subchondral bone. It is the most prevalent type of joint disease worldwide and is closely linked to aging. The World Health Organization (WHO) states that osteoarthritis is the primary cause of severe, persistent pain and physical disability, affecting a large number of people worldwide. Platelet-Rich Plasma, (PRP), is a concentrated form of human platelets that is higher than the body's typical platelet count. PRP has been used in surgical procedures since 1987 to promote cell regeneration, and a significant amount of evidence supports its efficaciousness as a treatment for tendinosis.

Objective: To ascertain the effectiveness of platelet-rich plasma (PRP) in the early stages of knee articular arthritis.

Study design: A cross-sectional study

Place and Duration: This study was conducted in Peoples Medical College & Hospital Nawabshah from July 2022 to July 2023

Methodology: There were a total of 150 people involved in this study, and this sample was calculated using a non-probability convenient sampling technique. The participants of this study were those who were diagnosed with early knee osteoarthritis. A 30–40 cc venous blood sample was taken from the ante-cubital vein and put in a sterile tube containing anticoagulant dextrose solution A (ACDA) in order to create 4-5 cc of Platelet-Rich Plasma (PRP) with a platelet concentration 4-6 times greater than the normal values. WOMAC and VAS scores were used to evaluate the

outcomes. SPSS version 20 was used to analyze the data. A p-value of less than 0.05 was considered significant.
Results: There are a total of 150 participants in this research. Out of these 150 people, there were 108 (72%) females, and the rest 42 were males. The mean age of the participants was 56.14 years. The average weight of the participants was 84.24 kg. Overall, 132 people had difficulty sitting on the floor. A total of 78 people had the right joint involvement. The mean VAS score before PRP was 7.21, and at 6 months, it was 5.12. A total of 74 patients had a satisfactory outcome, 46 participants had a fair outcome, and 30 people had a poor outcome.
Conclusion: One economical and minimally intrusive way to treat early-stage degenerative knee joint cartilage lesions is to use Platelet-Rich Plasma (PRP).

Keywords: Platelet-Rich Plasma (PRP), knee arthritis, osteoarthritis, effectiveness

INTRODUCTION

Osteoarthritis is a disorder that mainly affects the cartilage in synovial joints, resulting in localized damage and sclerosis of the subchondral bone [1, 2]. It is the most prevalent type of joint disease worldwide and is closely linked to aging. The World Health Organization (WHO) states that osteoarthritis is the primary cause of severe, persistent pain and physical disability, affecting a large number of people worldwide [3, 4]. The condition affects more than 80% of people who are 55 years of age and older, with the most common joints affected being the hips, knees, spine, hands, and feet [6].
Osteoarthritis is classified using the Kellgren and Lawrence system and has a significant impact on daily life. Grade 0: There are usually no obvious signs of osteoarthritis on X-ray scans. Grade 1: Osteophytes, or bone spurs, may be present, but it is unclear if there is a reduction in joint space. Grade 2: There is obvious evidence of bone spurs and a possible reduction in joint space, as indicated by X-rays. Grade 3: There is a noticeable decrease in joint space along with many bone spurs, harder edges, and possibly malformed bones. Grade 4: There are noticeable reductions in joint space, highly hardened edges, large bone spurs, and noticeable bone abnormalities.
Platelet-Rich Plasma (PRP) is a concentrated form of human platelets that is higher than the body's typical platelet count [7, 8]. PRP has been used in surgical procedures since 1987 to promote cell regeneration, and a significant amount of evidence supports its efficaciousness as a treatment for tendinosis [9]. A peripheral vein is used to extract the patient's blood, which is subsequently centrifuged to produce a tiny amount of plasma with a high platelet content. After surgery or an injury, this PRP is injected into the affected area.
It is anticipated that almost 50% of the population may develop knee articular arthritis at some point in their lives, which qualifies them as PRP research subjects [10]. There has been discussion and investigation of the efficacy of using Platelet-Rich Plasma (PRP) injections in the treatment of osteoarthritis [11]. Thus, the main objective of orthopedic professionals is to ensure a thorough and safe rehabilitation procedure while quickly returning patients to their pre-injury activity levels.
Utilizing autologous blood products, especially Platelet-Rich Plasma (PRP), to improve biological healing is a commonly used technique in the field of sports medicine. PRP is being used for a number of different conditions, including soft tissue ulcer treatment and promotion, diabetic ulcer healing acceleration, orthopedic trauma, and sports-related surgery bone healing. Additionally, it is used in cardiac surgery, burn therapy, aesthetic and reconstructive operations, and spinal and maxillofacial surgeries. The current study aims to ascertain the effectiveness of platelet-rich plasma (PRP) in the early stages of knee articular arthritis.

METHODOLOGY

There were a total of 150 people involved in this study, and this sample was calculated using a convenient non-probability sampling technique. The participants of this study were those who were diagnosed with early knee osteoarthritis. Every participant was briefed about the study, and their

informed written consent was obtained. The Ethical Review Committee approved the research. All the participants were selected from the OPD.

Exclusion criteria: Those patients who were having active infection, tumor around knee, inflammation, post-traumatic osteoarthritis, deviation of mechanical axis, and those receiving steroid injection into the knee joint during the last 6 months were not included in this study.

A 30–40 cc venous blood sample was taken from the ante-cubital vein and put in a sterile tube containing anticoagulant dextrose solution A (ACDA) in order to create 4-5 cc of platelet-rich Plasma (PRP) with a platelet concentration 4-6 times greater than the normal values. To minimize platelet damage, a needle with a width of 18G was utilized. The blood was centrifuged twice while an anticoagulant was added. It was spun for three minutes at 3000 rpm to separate the erythrocytes and for fifteen minutes at 4000 rpm to concentrate the platelets. One microgram of prostaglandin E1 was diluted in 0.005 milliliters of saline and added before the second cycle of centrifugation. The end result was 4-5 cc of PRP, which included leukocytes, and this was obtained as the final product in the form of a buffy layer.

The WOMAC and VAS scores were used to evaluate the outcomes. A VAS score of 0 denoted a totally pain-free walk, which was an excellent result. A score in the range of 1-4 denoted a satisfactory result with minor discomfort, but a score in the range of 5-7 indicated a decent result with significant pain and activity limits. A score between 8 and 10 indicated a bad result and excruciating discomfort. A premade form was used to capture a number of findings, such as improvements in range of motion, WOMAC scores, and VAS scores. The inclusion and exclusion criteria were strictly adhered to in order to reduce biases and confounding factors.

SPSS version 20 was used to analyze the data. All the qualitative variables were expressed in terms of percentages and frequency. All the qualitative variables were expressed in terms of the mean and SD. Stratification was used to control the effect modifiers. An ANOVA was performed to examine any significant differences between the groups. A p-value of less than 0.05 was considered significant.

RESULTS

There are a total of 150 participants in this research. Out of these 150 people, there were 108 (72%) females, and the rest 42 were males. The mean age of the participants was 56.14 years. The average weight of the participants was 84.24 kg. Table 1 shows demographic characteristics of the people involved in this study.

Table no. 1: demographic characteristics of the participants

Demographics	**N**
Mean Age (Years)	56.14
Gender	
● Female	108
● Male	42
Mean Weight (Kg)	84.24
Difficulty in sitting over floor	132
Joint involvement	
● Bilateral	21
● Left	51
● Right	78

Table number 2 shows the comparison of VAS score before and after PRP.

Table no. 2: comparison of VAS score before and after PRP

VAS Score	Mean	p-value
Before PRP	7.21	<0.01
At 6th week	6.56	<0.01
At 3 months	5.82	<0.01
At 6 months	5.12	<0.01

Table number 3 shows the WOMAC scoring system.

Table no. 3: WOMAC scoring system

WOMAC Score	Mean	p-value
Pain		<0.01
● **Before PRP**	17.08	
● **At 6th week**	15.78	
● **At 3 months**	14.78	
● **At 6 months**	14.02	
Physical function		<0.01
● **Before PRP**	58.77	
● **At 6th week**	55.34	
● **At 3 months**	51.66	
● **At 6 months**	48.04	
Stiffness		<0.01
● **Before PRP**	6.82	
● **At 6th week**	6.22	
● **At 3 months**	5.10	
● **At 6 months**	4.96	

Table number 4 shows the assessment of participant's satisfaction post PRP.

Table no. 4: participant's satisfaction post PRP

Osteoarthritis grade	VAS score	N
Grade 1	Satisfactory	74
Early grade 2	Fair	46
Advanced grade 2	Poor	30

DISCUSSION

PRP therapy was used in this study, and the results showed a significant reduction in joint pain and stiffness as well as improvements in functional outcomes. The average pain score was 17.08 prior to the PRP therapy, and it dropped to 14.02 after six months. In the same period, the mean stiffness score dropped from 6.82 to 4.96. Furthermore, the average functional outcome score dropped from 58.77 to 48.04. To summarize, 30.6% of participants reported a fair result, while 49.4% of persons obtained a satisfactory PRP score.

According to earlier studies, knee osteoarthritis is the primary cause of pain in the knee joint among the elderly globally [12, 13]. People who have this illness usually experience severe pain and discomfort. Osteoarthritis is a problem that needs to be managed patiently for both patients receiving conservative treatment and medical professionals, as the disease does not go away unless surgery is performed [14]. The strength of the symptoms can vary, from minor to severe, which encourages patients to explore different therapy choices in an effort to find relief. Many researchers have worked to find less intrusive, cost-efficient, and effective treatments with favorable outcomes, given the frequency, length, and intensity of these symptoms [15, 16]. As a result, both conservative and surgical treatments have been developed to treat the illness. Since not all patients choose surgery, these alternative therapy choices are important.

Various researchers injected different chemicals into the knees, including corticosteroids, hyaluronic acid, placebos, and platelet-rich plasma (PRP) [17]. PRP, which is autologous and derived from the patient's own blood, has demonstrated promising results in knee treatments with no known side effects. This is supported by the findings of the current investigation, which showed that injecting PRP in strict aseptic settings did not result in any problems [18].

According to Halpern B. et al., in a smaller clinical trial, most patients reported less pain one year after receiving a PRP injection compared to the year before, although this did not necessarily suggest that the patients' pain had vanished entirely [19]. Additionally, MRI scans revealed that most knee degeneration had not advanced. A total of 50 patients with knee articular arthritis who had two autologous PRP injections into their knee joints as part of a therapy regimen were followed up for at least a year after the study was published in the journal Sports Health [20]. All patients, including those who had previously undergone arthroscopic surgeries, reported considerable improvements in their pain and functional assessments and scores at both the 6- and 12-month marks, when they were able to return to their previous activities.

CONCLUSION

One economical and minimally intrusive way to treat early-stage degenerative knee joint cartilage lesions is to use platelet-rich Plasma (PRP). This method is easy to use, inexpensive, and has little chance of negative consequences. It has benefits for knee range of motion and general quality of life, as well as pain alleviation and patient satisfaction.

Funding source

This study was conducted without receiving financial support from any external source.

Conflict in the interest

The authors had no conflicts related to their interest in the execution of this study.

Permission

Prior to initiating the study, approval from the ethical committee was obtained to ensure adherence to ethical standards and guidelines.

REFERENCES

1. Ghori FS, Farooq MA, Khan KM. Effect of Plasma Enriched with Platelets in Mild to Moderate Osteoarthritis of Knee Joint. Journal of Pakistan Orthopaedic Association. 2023 Jun 14;35(2):23-8.
2. Saqlain HAU, Hussaine SS, Keerio NH, Qureshi MA, Valecha NK, Noor SS. Effect of platelet rich plasma injection effect of knee osteoarthritis in elderly: single dose versus double dose randomised clinical trial. *J. Pharm. Res. Int.* 2021; **33**: 84–9
3. Wu YT, Hsu KC, Li TY, Chang CK, Chen LC. Effects of platelet-rich plasma on pain and muscle strength in patients with knee osteoarthritis. American journal of physical medicine & rehabilitation. 2018 Apr 1;97(4):248-54.
4. Adatia A, Rainsford KD, Kean WF (2012) Osteoarthritis of the knee and hip. Part I: aetiology and pathogenesis as a basis for pharmacotherapy. J Pharm Pharmacol 64:617–625 2
5. Heidari B (2011) Knee osteoarthritis prevalence, risk factors, pathogenesis and features: part I. Casp J Intern Med 2:205– 212
6. Blagojevic M, Jinks C, Jeffery A, Jordan KP (2010) Risk factors for onset of osteoarthritis of the knee in older adults: a systematic review and meta-analysis. Osteoarthr Cartil 18:24–33
7. Murphy L, Helmick CG (2012) The impact of osteoarthritis in the United States. Orthop Nurs 31:85–91

8. Engebretsen L, Steffen K, Alsousou J, Anitua E, Bachl N, Devilee R, Everts P, Hamilton B, Huard J, Jenoure P and Kelberine F, (2010) IOC consensus paper on the use of platelet-rich plasma in sports medicine. British Journal of Sports Medicine 44(15):1072–1081
9. Ficek K, Kamiński T, Wach E, Cholewiński J, Cięszczyk P (2011) Application of platelet rich plasma in sports medicine. J Hum Kinet 30:85–97
10. Fernandes G, Yang S (2016) Application of platelet-rich plasma with stem cells in bone and periodontal tissue engineering. Bone Res 4:16036
11. Michael JW-P, Schlüter-Brust KU, Eysel P (2010) The epidemiology, etiology, diagnosis, and treatment of osteoarthritis of the knee. Dtsch Aerzteblatt Online 107:152– 162
12. Cerza F, Carnì S, Carcangiu A et al (2012) Comparison between hyaluronic acid and platelet-rich plasma, intraarticular infiltration in the treatment of gonarthrosis. Am J Sports Med 40:2822–2827
13. Cole BJ, Karas V, Hussey K et al (2017) Hyaluronic acid versus platelet-rich plasma: a prospective, double-blind randomized controlled trial comparing clinical outcomes and effects on intra-articular biology for the treatment of knee osteoarthritis. Am J Sports Med 45:339–346
14. Filardo G, Kon E, Di Martino A, Di Matteo B, Merli ML, Cenacchi A, Fornasari PM, Marcacci M (2012a) Platelet-rich plasma vs hyaluronic acid to treat knee degenerative pathology: study design and preliminary results of a randomized controlled trial. BMC Musculoskelet Disord 13:229
15. Michael JW-P, Schluter-Brust KU, Eysel P(2010) The epidemiology, etiology, diagnosis, and treatment of osteoarthritis of the knee. Dtsch Aerztblatt Online 107:152- 162
16. Keerio NH, Aamir N, Kumar N, Qureshi MA, us Saqlain HA, Noor SS. Incidence of writing double NSAIDs in a single prescription for osteoarthritis. The Professional Medical Journal. 2021 May 10;28(05):702-6.
17. Dhillon MS, Patel S, John R (2017) PRP in OA knee – update, current confusions and future options. Sicot-J 3:27
18. KonE1, Mandelbaum B, Buda R, Filardo G, Decolgiano M, Temoncini A et al: Platelet rich plasma intra articular injection versus hyaluronic and viscosupplementation as treatments for cartilage pathology from early degeneration to osteoarthritis Clin J Sport Med 2013;23(3):238-239
19. Halpern B, Chaudhury S, Rodeo SA, Hayter C, Bogner E, Potter HG, Nguyen J. Clinical and MRI outcomes after platelet-rich plasma treatment for knee osteoarthritis. Clin J Sport Med. 2013 May;23(3):238-9. doi: 10.1097/JSM.0b013e31827c3846. PubMed PMID: 23238250.
20. Gobbi A, Karnatzikos G, Mahajan V, Malchira S. Platelet-rich plasma treatment in symptomatic patients with knee osteoarthritis: preliminary results in a group of active patients. Sports Health. 2012;4(2):162-72.