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Original Article

EFFECTS OF PLATELET-RICH PLASMA INJECTIONS ON OSTEOARTHRITIC PATIENTS

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ABSTRACT

Objective: Various treatment options are available for knee osteoarthritis such as medical treatment with NSAID, conservative management with platelet-rich plasma (PRP) and corticosteroids. We have done this prospective study to know the use and safety of platelet-rich plasma (PRP) injections in knee osteoarthritis (KOA) patients. We know platelet-rich plasma (PRP) clinical and functional outcome in knee osteoarthritis (KOA) by doing this study and using the available literature.

Methods: This prospective study consisted of a total number of 96 patients suffering from knee osteoarthritis. Both males and females are included. Intra-articular injection of platelet-rich plasma (PRP) was given in sterile conditions and clinical and functional outcomes were analyzed with Western Ontario and McMaster University Arthritis Index (WOMAC), Visual Analogic Scale (VAS), and Knee Society score (KSS). This study is done in a tertiary care institute during the study period.

Results: Most patients were females aged>40 y with knee osteoarthritis. The injections of platelet-rich plasma (PRP) showed results at three, six and twelve months follow-up showed significantly reduced WOMAC scores, Visual Analogic Scale (VAS) and Knee Society score (KSS). No complications were observed during the follow-up period.

Conclusion: The results confirm the efficacy of the PRP injections on Knee osteoarthritis, suggesting that decreasing pain was obtained one month after injection, with the best results observed after 12 mo; however, a more extensive study group. Follow-up is required for a prolonged period to assess the efficacy of PRP injection.

Keywords: Knee osteoarthritis, Cartilage, Platelet-rich plasma (PRP), Knee injection, Biologic therapy

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INTRODUCTION

This prospective study aimed to know the use and safety of platelet-rich plasma (PRP) injections in knee osteoarthritis (KOA) patients. Primary knee osteoarthritis (O. A.) continues to be a hard-to-control degenerative disease. With the increase in average life expectancy and the prevalence of obesity, O. A. is creating a rising economic and physical burden [1]. Knee osteoarthritis (O. A.) is a chronic musculoskeletal condition that can eventually require surgical in knee osteoarthritis (O. A.) intervention. Thus patients continue to search for potential non operative therapies, such as platelet-rich plasma (PRP) injections into the affected knee [2]. According to Jayaram *et al.*, platelet-rich plasma (PRP) is an emergent therapeutic approach for treating O. A.; however, clinical evidence is still needed for its effectiveness, and its mechanisms of action are indeterminate [3]. Despite promising outcomes reported about platelet-rich plasma (PRP) utilization in knee O. A., crucial issues such as conclusive evidence about its effectiveness, standard dose, and good. Preparation techniques still need to be discovered [4]. Contemporary guidelines advise both non-drug (such as exercise) and drug treatments, such as oral non-steroidal anti-inflammatory drugs (NSAIDs) [5]. Repeated injections are related to augmented cartilage Loss [6]. An autologous blood product containing various growth factors (G. F. s), cytokines, and platelet-rich plasma (PRP) is given intra-articular has shown promising results in achieving this goal and evaluating the effects of Intra articular platelet-rich plasma (PRP) injections on symptoms and joint structure in patients with symptomatic mild to moderate Osteoarthritis from January 2022 to January 2023. Patients received three consecutive platelet-rich plasma (PRP) injections and Western Ontario and McMaster University Arthritis Index (WOMAC), Visual Analogic Scale (VAS), Knee society score (KSS), Knee society score (KSS) are evaluated before giving platelet-rich plasma (PRP) injection (T0), three months (T1), six months (T2), and twelve months (T3) after the treatment. All patients underwent baseline, and at 12 mo, follow-up, MRI and X-ray evaluation was done.

MATERIALS AND METHODS

It is a prospective observational study in the Department of Orthopedics, Kurnool Medical College. Based on the data collected from the registers from January 2022 to January 2023, the data includes the demographic characteristics (i.e., Age and Gender of the patients). This study was conducted after getting proper consent from all the patients involved. This study was conducted after taking ethical committee approval from Kurnool medical college with approval no 0122/KMC/2022.

Inclusion criteria

1. Age between 40 and 80; (2) Body mass index (BMI) between 20 and 29.9; (3) history (for at least six months) of knee joint pain; (4) Radio graphically documented knee osteoarthritis of grades1 to 3

Exclusion criteria

Radio graphically severe documented knee osteoarthritis of grade 4 (K-L radiographic classification scale); (2) Previous femur and tibia fractures; (3) Knee previous surgical treatment (e. g., arthroscopy); (4) Hyaluronic acid infiltration within the last six months; (5) Hemoglobin levels<10 g/dl; (6) History of oncohaemotological disease, infections, or immunosuppression.

All tests were performed in the same place, and the same researchers (two orthopedic surgeons with more than ten years of experience in knee surgery) tested all patients. The evaluation times were T0 (recruitment), T1 (three months after the last injection), T2 (six months after the last injection), and T3 (twelve months after the previous injection). Their MRI and X-ray images at baseline and 12 mo were analyzed and included in this study.

Prp preparation

In the treatment, the procedure was as follows.

A 20 cc syringe with two cc of ADA, and 18 cc venous blood was

drawn. Blood was injected into the centrifuge vial through the upper port. After 1st centrifugation in the "REMI" platelet-rich plasma (PRP) centrifuge, the height was adjusted, pulling the knob up and down. Plasma and the RBC layer were blocked. After the 2nd centrifugation, the upper silicone lid was opened, and a pipette was extracted from the platelet-rich plasma (PRP). A leukocyte filter was then used, and platelet-rich plasma (PRP) activation was done by adding 10% calcium chloride. Platelet-rich plasma (PRP) was injected with the help of a 10 ml syringe. Finally, the platelet concentrate was drawn. The platelet-rich plasma (PRP) was divided into two disposable syringes. One syringe was sent for analysis of platelet concentration, and the second part was used for intra-articular injection in patients within two hours of preparation.

The first injection was given under aseptic conditions-10 ml of platelet-rich plasma (PRP) through the anterolateral approach with a 22-gauge needle was given into the knee joint. Moving the knee allows the platelet-rich plasma (PRP) to spread in the knee joint. The knee was kept in extension for 25 min. After injection, some patients who developed complications like sweating, dizziness, and nausea were observed and discharged when fully recovered. All patients were followed up at three months, six months, and one year. Western Ontario and McMaster University Arthritis Index (WOMAC) scoring and Visual Analogue Scale (VAS) for pain before starting the treatment and then at six weeks, three months, six months, and one year of treatment.

RESULTS

The current study recruited one hundred patients (38 males and 62 females) males affected by knee osteoarthritis (O. A.). The mean age of the knee osteoarthritis (O. A.) patient was 59, with the patients' age range between 40 and 81 y. Out of these 100 patients, some patients were lost to follow-up. Out of 96 finally analyzed patients, 60 were female and 36 were male and received platelet-rich plasma (PRP) injections. No complications were observed during the follow-up period.

Table 1: Baseline evaluation of study participants

Participant's variables

Age	Percentage	
40 to 80 y	96	100
Gender		
Male	36	37.5
Female	60	62.5
BMI	Values	Percentage
Less than 25	63	65.62
More than 25	33	34.34
Side		
Left	28	29.16
Right	68	70.80
Kellgren Lawrence grade		
Grade one	27	28.12
Grade two	32	33.33
Grade three	37	38.50

Womac pain scale

It is a questionnaire consisting of 24 items divided into three subscales.

Pain (5 items): walking, using stairs, in bed, sitting or lying, and standing upright.

Stiffness (2 items): after first waking and during the day

Physical function (17 items)

Using stairs, standing, bending, walking, getting in or out of a car, shopping, putting on/taking off socks. The questions are scored on a scale from zero to four, corresponding to 0–none, 1-mild, 2-moderate, 3-severe; 4-extreme. The scores for each sub-scale are summed up with a score range of 0–20 for pain, 0–8 for stiffness, and 0–68 for function. Higher WOMAC scores indicate worse pain, stiffness and functional decrease in activity. The WOMAC functional limitations value demonstrated a statistically significant reduction betweenT0 and T1, T1-T2, T2-T3, and T0 and T3. The WOMAC pain value showed statistically significant reduction between T0-T1, between T1-T2, between T2-T3 and, and between T0-T3. The WOMAC total value showed a statistically significant reduction between T1 and T2, T2 and T3, and T0 and T3. The WOMAC stiffness value showed a statistically significant reduction between T0 and T1 and T2 and T3.

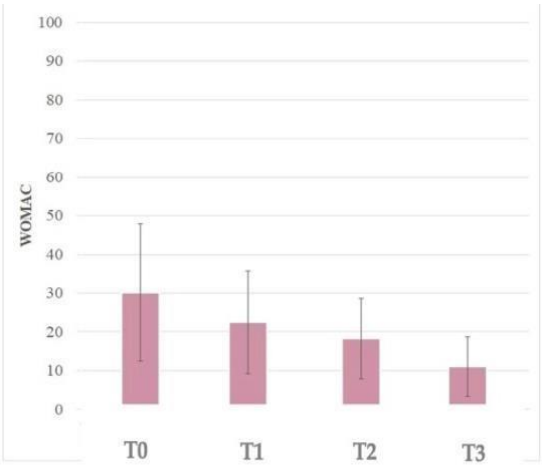

Fig. 1: Comparison between evaluation times of WOMAC Score. T0-Recruitment, T1-3 mo after the last injection, T2-6 mo after the infusion, T3-12 mo after the injection

Knee society score

PART 1: Knee score: 1. pain, 2. flexion contracture, 3. Extension lag, 4. the total range of flexion is 5. Alignment (varus and valgus) 6. Anteroposterior stability (maximum movement in any position) 7. Mediolateral stability (entire movement in any position).

PART 2: Function: 1. Walking, 2. Stairs, 3. Walking aids used.

The Knee score, part of KSS, significantly increased over time between T0-T1, T1-T2, T2-T3, and T0-T3. The functional KSS score showed statistically significant differences between T0 and T1, between T2-T3, and between T0-T3.

Visual analogue scale

Visual analogue scale (VAS) is a 10 cm line with statements on the left (no pain) and on the right (extreme pain). No pain (0-5 mm) Mild pain-(5-45 mm) Moderate pain-(45-74 mm) Severe pain (75-100 mm)

The Visual analogue scale (VAS) score improved statistically significantly between T0 and T1, T1 andT2, T2 and T3, and T0 and T3. No statistically significant difference was shown between T1 and T2.

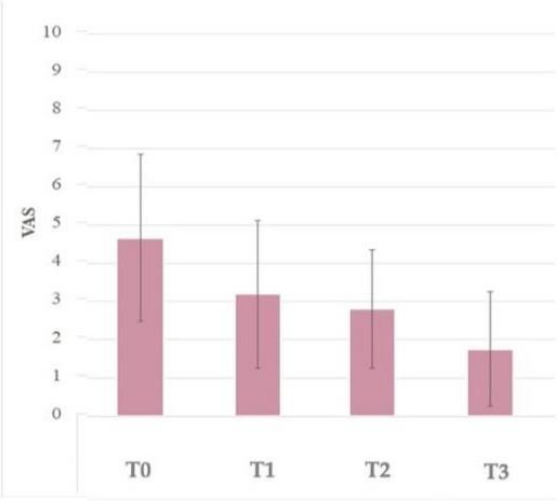

Fig. 2: Visual analogue scale of participants. T0-Recruitment, T1-3 mo after the last injection, T2-6 mo after the infusion, T3-12 mo after the injection

MRI

The tibia and femoral plate thickness improved non-statistically between T0 and T3. MRI Evaluation of the knee at T0 and T 3. A) baseline (T0) MRI T 1 Sagittal image of a 41 y old female (b) 12 mo (T3) follow-up MRI T1-sagittal image of a 41 y old female. No x-ray changes have been demonstrated using the Kellgren-Lawrence radiographic classification scale. Patients with knee osteoarthritis who received intra-articular injections of PRP had better pain relief when compared to steroids, hyaluronic acid, and placebo. The results of this study highlight that PRP infiltrations represent a beneficial conservative treatment to reduce pain and improve functional scores at the midterm12-month follow-up. Positive effects were shown on patients with decreasing pain, as indicated by the WOMAC pain index, and KSS patients with reduced pain, as noted in the WOMAC pain index, Knee society score (KSS) index, and Visual analogue scale (VAS). WOMAC and Knee society score (KSS) also indicated that the physical function was improved, even if there was no statistical evidence comparing the Knee society score (KSS) at three-month, six-month, and 12 mo follow-ups. All the scores referring to stiffness and physical function showed improvement over time, agreeing with a previous study that pointed out a decrease in the WOMAC index and an increase in the Knee society score (KSS) total score, suggesting a positive influence of treatment.

DISCUSSION

Platelet-rich plasma (PRP) has shown outstanding promise as an agent of tissue repair and regeneration-studies involving platelet-rich plasma (PRP) point towards some improvement in pain and function. Zhair *et al.* developed a workflow to assess *in vitro* responses to platelet-rich plasma (PRP) and correlated them with platelet-rich plasma (PRP) composition and clinical results in knee osteoarthritis (O. A.), patients. Identified responders and no responders to platelet-rich plasma (PRP) treatment based on patient-reported results and minimal clinically significant differences [7]. French-speaking experts' consensus recommended platelet-rich plasma (PRP) for early to moderate knee osteoarthritis (O. A.), preferring LP-PRP and advising against mixing platelet-rich plasma (PRP) with anesthetics or corticosteroids. Recommendations had a low level of evidence and were based on expert clinical experience [8]. However, the study by Benn ell *et al.* showed that among patients with symptomatic mild-to-moderate radiographic knee osteoarthritis (O. A.), intra-articular injection of platelet-rich plasma (PRP) did not result in a significant difference in symptoms at 12 mo compared with saline injection (placebo) [9]. The best outcomes were attained by individuals aged 51–65 with lower mechanical axis angles and patients with K/l stage 2 OA [10]. However, the study by Benn ell *et al.* showed that among patients with symptomatic mild-to-moderate radiographic knee osteoarthritis (O. A.), intra-articular injection of platelet-rich plasma (PRP) did not result in a significant difference in symptoms at 12 mo compared with saline injection (placebo) [11]. Compared with other studies in our study, we found that platelet-rich plasma (PRP) infiltrations represent a beneficial conservative treatment to reduce pain and improve functional scores at the midterm 12 mo follow-up. Positive effects were shown on patients with decreasing pain, as indicated by the WOMAC pain index, and KSS patients with reduced pain, as noted in the WOMAC pain index, KSS index, and Visual analogue scale (VAS), physical function was improved, even if there was no statistical evidence comparing the KSS Score at three-month, six-month, and 12 mo follow-ups., However, In our study, there need to be more statistical differences in the Knee Score part of KSS that refers to flexion contracture, extension lag, alignment, anteroposterior and mediolateral stability. This aspect has never been pointed out by other authors, who directed only to the total KSS score, suggesting that further study is required to highlight the role of the pain score on the total KSS score. Most studies do not show an improvement in X-rays and MRI, which aligns with our results. However long term follows up with increase in sample size of patients is needed to know the clinical efficacy of platelet rich plasma (PRP).

CONCLUSION

The results confirm the efficacy of the platelet-rich plasma (PRP) injections on knee osteoarthritis (O. A.), suggesting that decreasing pain was obtained one month after injection, with the best results observed after 12 mo. They indicate in further studies that data could be collected and recorded at only three different times: at recruitment, six and twelve months after administration, leading to a time-reduced follow-up protocol. Long-term follow-up is required. The efficacy of intra-particular platelet-rich plasma (PRP) injections for knee osteoarthritis (O. A.) remains a topic of debate, even though recent publications indicate short-term pain relief. A recent meta-analysis of high-quality randomized controlled trials (evidence level I) found that platelet-rich plasma (PRP) yielded the most favorable overall outcomes compared to corticosteroids, hyaluronic acid (H. A.) and placebo for individuals with knee osteoarthritis (O. A.) at 3, 6, and 12 mo. Despite inconclusive clinical data and basic science information, orthopedic surgeons treating knee osteoarthritis (O. A.) patients are increasingly intrigued by PRP. There is a growing interest in platelet-rich plasma (PRP), but more studies directly comparing platelet-rich plasma (PRP) with a placebo are needed.

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AUTHORS CONTRIBUTIONS

Chella Sivakumar planned the study, collected the data and wrote the manuscript; Satyanarayana analyzed the data and reviewed the manuscript, Deepak and Ravi analyzed the data.

CONFLICT OF INTERESTS

Declared none

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