



A PROSPECTIVE STUDY OF ARTHROSCOPIC DEBRIDEMENT COMBINED WITH PLATELET RICH PLASMA INJECTION IN EARLY OSTEOARTHRITIS OF KNEE JOINT

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ABSTRACT **Background** Osteoarthritis (OA) of the knee joint being one of the leading causes of musculoskeletal disability, has also shown increased prevalence in the Indian population. It has been observed that with careful patient selection arthroscopic debridement can provide good symptomatic relief. In the recent years, autologous platelet-rich plasma has emerged as a better treatment option. We propose that combining these two procedures together will give better results in some cases of early OA. **Objectives** To determine the efficacy and functional outcome of arthroscopic debridement along with intra-articular infiltration of autologous platelet rich plasma in early OA knee. To assess the safety of usage of intra-articular infiltration of platelet rich plasma in early OA knee. **Materials and methods** A prospective study conducted for a period of 24 months among 55 patients with early osteoarthritis at SSIMS & RC hospital, Davanagere, Karnataka. Under aseptic precautions, arthroscopic debridement of knee was done, after debridement 4 ml platelet concentrate was injected into knee joint. The pain assessment was done by Visual Analogue Scale (VAS), and the course of disease and effectiveness of therapy was assessed by measurement of Western Ontario and McMaster Universities Arthritis Index (WOMAC), before procedure and at 6 weeks, 3 months, and 6 months after procedure. **Results** Osteoarthritis of knee joint was affected on both sides in about 41.8%. The mean VAS score at baseline was 6.54 ± 0.719. The mean WOMAC score at baseline was 71.07 ± 3.826. On comparing the mean baseline with the variation in each follow up, we found statistically significant relation, suggesting that there was improvement in the condition of the participants. **Conclusion** The study found that arthroscopic debridement with intra-articular infiltration of platelet rich plasma in early osteoarthritis knee significantly reduced the pain, as the mean values of VAS score decreased drastically, and also improved the condition of the participants.

KEYWORDS : Autologous Platelet Rich Plasma, Osteoarthritis of Knee, Visual Analogue Scale, WOMAC Score.

Introduction

Osteoarthritis (OA) affects the knee more often than any other joint. With the ageing of the population in India and the growing obesity epidemic, the number of surgical procedures for knee OA is increasing in recent years specially TKR surgeries. As replacement surgeries are costly other treatment options at the beginning of OA knee would be of great value^{1,2}.

Emerging evidence suggests platelet rich plasma (PRP) has the potential to have a regenerative effect on certain body tissues³. PRP has been shown to provide some symptomatic relief in early OA knee and to be at least as effective as intra-articular steroid and hyaluronic acid injection for symptoms control⁴. As PRP is an autologous blood product, there is no risk of immunological reactions.^{4,8,9,11}

Arthroscopic debridement is generally indicated in patients with knee joint pain that are refractory to medical treatment, with or without mechanical problems^{5,6,7}. Observational studies have shown benefits for arthroscopic debridement on the OA knee, but other recent studies yielded conflicting results that suggests arthroscopic debridement may not be effective.¹⁰

Objectives

To determine the efficacy and functional outcome of arthroscopic debridement along with intra-articular infiltration of autologous platelet rich plasma in early OA knee. To assess the safety of usage of intra-articular infiltration of platelet rich plasma in early OA knee.

Materials and methods

The study involved patients with early OA knee attending outpatient Department of Orthopaedics, at Shamanur Shivashankarappa Institute of Medical Science & Research Centre, Davanagere. The duration of study was between October 2019 to September 2021. It was a prospective clinical study.

Inclusion Criteria:

- Age more than 40 years of either gender
- Patients who give informed consent and willing for follow up
- Patients with osteoarthritis knee of grade ≤2 as per Kellgren-Lawrence scale

Exclusion Criteria:

- Inflammatory arthritis of knee joints
- Hematological diseases (coagulopathies)
- Active infection
- Patients with immunosuppression

After obtaining clearance and approval from the institutional ethical committee, patients fulfilling the inclusion criteria were considered for the study after obtaining informed consent. The demographic data and relevant history of the study participants were collected and necessary clinical and radiological examination was performed. Osteoarthritis knee grading was based on radiographs.

Surgical procedure

The arthroscope is introduced through anterolateral portal and a working portal placed anteromedially. The arthroscopic examination proceeded from patellofemoral to the medial compartment, to the intercondylar region and finally the lateral compartment with the popliteal recess. Areas of articular cartilage fibrillation and unstable chondral flaps are debrided with a small synovial resector and arthroscopic forceps to remove potential joint debris. All mobile meniscal tears are resected using both hand instruments and shaver. Loose bodies are removed. An extensive lavage is performed. A final check for loose bodies should include the popliteal recess.

PRP Preparation

Anti-cubital vein of the patient was used to draw 20 ml of blood under aseptic precautions into a centrifuge vial which is preloaded with CPDA (Citrate-Phosphate-Dextrose and Adenine) as anticoagulant preservative solution and constant efforts were made to avoid irritation and trauma to platelets which are in a resting state. The whole blood was then centrifuged for 15 min at 1600 rpm inside a table top centrifuge. The blood was then separated into platelet-rich plasma (supernatant plasma) which contains platelets and WBCs and red blood cell (RBCs) are settled down. The tube was then again brought inside the biosafety cabinet. The PRP was extracted through a pipette and transferred to another sterile tube. It was again subjected to centrifugation for 10 minutes at 2600 rpm. After this the supernatant platelet poor plasma was pipetted inside the biosafety cabinet into another sterile tube so as to leave behind 10 ml plasma along with the

platelet pellet at the bottom. The platelet pellet was then re-suspended in the remaining plasma as the final PRP and was dispensed in a sterile syringe. The final PRP volume of 3-4 ml each was dispensed in sterile syringe.



Whole blood for 1st centrifugation Kept for 2nd centrifugation



Final plasma after 2nd centrifugation Final PRP of 4ml for injection.

Inj. Calcium Gluconate diluted was diluted with Normal Saline (1:7) to make Calcium content (M/40) inside the biosafety cabinet. Diluted calcium gluconate (M/40) was also dispensed in separate syringe for injection with PRP in a ratio of 1:4 (1ml calcium gluconate for 4ml of PRP).

PRP Injection - Through the anterolateral portal 4 mL of platelet concentrate was injected into the joint with a 20 gauge needle without local anaesthetic. PRP was injected with activator (calcium gluconate) in a ratio of 4:1 (1 ml calcium gluconate with every 4 ml PRP).

Outcome measure: Assessment of pain by Visual Analogue Scale (VAS) was done before injection and at 6 weeks, 3 months and 6 months after injection. Measurement of Western Ontario and McMaster Universities Arthritis Index (WOMAC) parameters was done before injection and at 6 weeks, 3 months and 6 months after injection.

Results

Table 1: Age distribution of study participants

Age in categories	Frequency (N)	Percentage %
41 - 45	4	7.3
46 - 50	14	25.5
51 - 55	22	40.0
56 - 60	12	21.8
>60	3	5.5
Total	55	100%

The mean age of the participants in the study was 52.95 years ±5.32 years. The minimum age and maximum age of the study participants were 42 years and 68 years, respectively.

Table 2: Distribution of study participants based on gender

Gender	Frequency	Percentage
Male	18	32.5
Female	37	67.3
Total	55	100%

In the study, majority of the participants were females i.e., about 67.3%. Remaining 32.7% of them were males. This suggests that osteoarthritis of knee joint is more prevalent in females.

Table 3: Distribution Of Study Participants Based On Laterality Of The Joint

Knee involvement	Frequency	Percentage %
Bilateral	23	41.8
Right	20	36.4

Left	12	21.8
Total	55	100%

In the study, osteoarthritis of knee joint was affected on both sides in majority of the cases i.e., about 41.8%. The next common presentation was in right side, followed by left side laterality.

Table 4: Comparison of VAS over the follow up

Visual Analogue Scale	Mean	Standard Deviation	t - Value		p - Value
First Follow-Up	Baseline	6.54	0.719	16.279	<0.00
	6 Weeks	5.70	0.838		
Second Follow-Up	Baseline	6.54	0.719	43.756	<0.001
	3 Months	4.65	0.718		
Third Follow-Up	Baseline	6.54	0.719	73.022	<0.001
	6 Months	3.63	0.808		

The mean VAS score of the study participants at the baseline was 6.54 with a standard deviation of around ± 0.719. This implies that the study participants were experiencing more pain before the intervention. Later, the follow up was made on 3 different occasions. The variation in VAS scores from the baseline was compared in each follow up i.e., 6 weeks, 3 months and 6 months after the intervention. On analyzing the variation in means using paired sample t-test, the study found statistically significant relation in all 3 follow-ups, thereby suggesting that there was a lot of improvement in the condition of the participants as the mean values of VAS score decreased drastically.

Table 5: Comparison of WOMAC Score over the follow up

WOMAC Score	Mean	Standard Deviation	t - Value	p - Value	
First Follow-Up	Baseline	71.01	3.826	46.071	<0.001
	6 Weeks	66.24	3.986		
Second Follow-Up	Baseline	71.07	3.826	65.099	<0.001
	3 Months	61.54	4.364		
Third Follow-Up	Baseline	71.07	3.826	87.012	<0.001
	6 Months	56.28	4.393		

In the study, the mean WOMAC score of the participants at the baseline was 71.07 with a standard deviation of around ± 3.826. This implies that the study participants were experiencing more pain, increased stiffness and disturbed function of the joint before the intervention. Later, the follow up was made on 3 different occasions. The variation in WOMAC scores from the baseline was compared in each follow up i.e., 6 weeks, 3 months and 6 months after the intervention. On analysing the variation in means using paired sample t-test, the study found statistically significant relation in all 3 follow-ups, thereby suggesting that there was a lot of improvement in the condition of the participants as the mean values of WOMAC score decreased drastically.

DISCUSSION

Osteoarthritis is a disorder of synovial joints characterized by focal loss of hyaline cartilage with proliferation of new bone and remodeling of joint contour, mainly due to uncoupling of balance between cartilage regeneration and degeneration. Platelet rich plasma has emerged as a good prospect in early OA knees compared to various intra-articular modalities^{2,14}.

The present prospective clinical study was conducted to assess the safety of usage of intra-articular infiltration of platelet rich plasma in early osteoarthritis knee. Various studies had been conducted in the past decades with the similar objectives all over the world. A Study in Germany by Buchard R. et al 15 included 59 patients with MRI proven OA knee where PRP was performed with a low-leukocyte autologous conditioned plasma. Another study by Halpern B16. et al, observed 22 patients with OA knee in New York for a follow-up period of 1 year after treating them with PRP.

In the present study, majority of the participants i.e., about 40.0% cases belonged to the age group of around 51-55 years. The next common age group was 46-50 years which comprised about one fourth of the population. The mean age of the participants was 52.95 years with a standard deviation of around ± 5.32 years. Majority of the participants in the present study were females i.e., about 67.3%. Remaining 32.7%

of them were males. This suggests that osteoarthritis of knee joint is more prevalent in females.

Visual Analogue Scale had been regarded as the best tool in appreciating the severity of the pain since decades. Thus, VAS was assessed in the present study, and the mean score of the participants at the baseline was estimated to be 6.54 with a standard deviation of around ± 0.719 . This implies that the study participants were experiencing more pain before the intervention. Later, the variation in VAS scores from the baseline was compared in each follow up i.e., 6 weeks, 3 months and 6 months after the intervention. On analyzing the variation in means using paired sample t-test, the study found statistically significant relation in all 3 follow-ups, thereby suggesting that there was a lot of improvement in the condition of the participants as the mean values of VAS score decreased drastically.

In the present study, Western Ontario and McMaster Universities Arthritis Index (WOMAC) questionnaire was used to evaluate the outcome. Accordingly, the mean WOMAC score of the participants at the baseline was 71.07 with a standard deviation of around ± 3.826 . This implies that the study participants were experiencing more pain, increased stiffness, and disturbed function of the joint before the intervention. Also, this is quite huge compared to the previous studies such as Raeissadat S.A. et al¹⁷, Huang P.H. et al¹⁵, and Halpern B. et al¹⁶ where the mean WOMAC total was around 30. Later, the variation in WOMAC scores from the baseline was compared in each follow up of the study i.e., 6 weeks, 3 months and 6 months after the intervention. On analysing the variation in means using paired sample t-test, the study found statistically significant relation in all 3 follow-ups, thereby suggesting that there was a lot of improvement in the condition of the participants as the mean values of WOMAC score decreased drastically.

Conclusion

Arthroscopic debridement combined with injection of autologous platelet rich plasma in the patients with early osteoarthritis knee, done in our study showed the following;

- There is significant reduction in the pain in the joint of the participants as the mean values of VAS score decreased drastically
 - Also, the mean values of WOMAC score decreased gradually, thereby implying a lot of improvement in the condition of the participants

- As the side effects were insignificant, the usage of intra-articular infiltration of platelet rich plasma in early osteoarthritis knee was proven to be safe.

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