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OPTIMISING KNEE OSTEOARTHRITIS CARE: FUNCTIONAL OUTCOMES OF ARTHROSCOPIC SURGICAL DEBRIDEMENT WITH PLATELET RICH PLASMA INJECTION FOR KELLGREN AND LAWRENCE GRADE 2 KNEE OSTEOARTHRITIS IN A TERTIARY CARE CENTRE IN CHENGALPATTU DISTRICT

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ABSTRACT

Background: Osteoarthritis (OA) occurs when the hyaline cartilage in the joint is eroded, therefore causing friction and associated erosion of the bone articular surface. Combining Arthroscopic debridement with Platelet Rich Plasma (PRP) injections will exert anti-inflammatory action on the synovial membrane as well as stimulate the proliferation of chondrocytes and differentiation of mesenchymal cells of the subchondral bone into the chondrogenic cell line. This study aims to assess the functional outcome of a case of Osteoarthritis of the Knee (Kellgren and Lawrence II) when treated with Arthroscopic debridement and Platelet Rich Plasma injection. **Materials and Methods:** 45 patients admitted with Radiologically Diagnosed Osteoarthritis of knee (Classified under Kellgren and Lawrence Classification as Grade II) were given a choice to become a part of this study. Combined arthroscopic debridement and PRP injection procedure was performed and the patients were followed up periodically at 1, 3 and 6 month interval to assess the pain and functional outcome based on VAS and WOMAC scores. **Results:** The average VAS score was found to have steadily dropped from 7.95 ± 0.76 at pre-op to 5.77 ± 0.90 at 1 month, 4.10 ± 0.77 at 3 months, and 2.22 ± 0.99 at 6 months. The WOMAC score was assessed and found to be falling from 67.35 ± 7.60 at the beginning of the procedure to 52.04 ± 8.71 at one month, 42.75 ± 7.28 at three months, and finally 32.53 ± 3.97 at six months indicating a favourable functional outcome of the surgery in terms of pain and quality of life. **Conclusion:** The study concludes that arthroscopic debridement combined with intra-articular PRP injection has demonstrated good outcomes in terms of pain alleviation and functional improvement. Additionally, it increases the duration of arthroscopic debridement treatment efficacy in individuals with OA of the knee.

INTRODUCTION

Osteoarthritis (OA) is a common cause of musculoskeletal discomfort, with the knee being one of the most commonly affected joints.¹ Damage or degradation of the hyaline cartilage, which permits frictionless joint movement causes osteoarthritis. Hyaline cartilage protects the bone from overstress and injury by dispersing the forces produced during movement.² Since there is now no known treatment for OA, the goal of care is to assist patients in achieving symptomatic relief by reducing their pain and disability. The decision to proceed with surgery is influenced by various factors such as age, degree of physical activity, co-occurring conditions, severity of symptoms, and pain and stiffness in the knee.³

For knee osteoarthritis, lavage, partial meniscectomy, synovectomy, and loose body removal are among the arthroscopic procedures used in treatment.⁴ The epidemiological studies show that the prevalence of OA knee varies significantly according to the joint(s) involved, the sampled population, and the case definition.⁵ The presence of joint space narrowing, osteophytes, and other conditions in radiological investigations does not by itself support the necessity for surgery, which is only recommended when pertinent symptoms and indicators of advanced disease are present. Remarkably, more than half of patients with knee OA are younger than 65.⁶ There is evidence that depression symptoms are more common in those with lower limb OA than in people without the condition, indicating that OA may also negatively impact mental health.

Individuals with OA of the knee who were diagnosed within a year of each other fare better after arthroscopic debridement of the knee than individuals whose symptoms had been present for a longer time.⁸ These procedures help relieve early-stage arthritic symptoms temporarily, but they cannot halt the disease's progression. A prospective study found that 75% of patients experienced adequate or outstanding outcomes following arthroscopic debridement treatments.⁹ While there was considerable improvement in the data supporting arthroscopic debridement, studies revealed that orthopaedic surgeons were not very good at predicting which patients would improve.¹⁰

The blood product known as platelet-rich plasma (PRP) has gained increased interest recently. Platelet concentrates have been proposed as a simple, less invasive way to inject a high concentration of autologous growth factors and other bioactive compounds in physiological proportions. PRP is thought to stimulate the growth of chondrocytes and the differentiation of mesenchymal cells in the subchondral bone into the chondrogenic line. Adding PRP injections during knee debridement can promote early clinical improvement since PRP is thought to have an anti-inflammatory effect on the synovial membrane.¹¹ People with OA in their joints have different microenvironments depending on the stage of the illness, which influences how efficiently PRP functions in each patient's unique setting.¹²

Studies exist related to arthroscopic procedures for osteoarthritis as well as PRP injections for the same but in our study, we have tried to assess the functional outcome after a combined use of both these modalities in the same setting. We have assessed the pain outcome using the visual analogue scale (VAS) and the functional outcome using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score.

MATERIALS AND METHODS

This prospective, hospital-based study was done in a tertiary care hospital in Chengalpattu, Tamil Nadu from October 2022 to April 2024. The study was approved by the institutional ethics committee after which, 45 patients with radiologically diagnosed OA of the knee (Kellgren and Lawrence Grade 2) who met our inclusion and exclusion criteria were given a choice to become part of this study. Inclusion criteria included Patients aged 35-60 years, radiological diagnosis of OA with classification based on Kellgren and Lawrence as Grade II. Exclusion criteria included Patients with deformities, patients with fractures and patients unfit for surgery. The patients who opted to take part in the study were informed about the procedure and informed consent was obtained from them.

After admission, a thorough clinical examination and radiographic imaging of the knee joints were performed, and blood samples were collected for routine preoperative evaluation and also for PRP preparation, PRP was prepared in the blood bank of the same institute. The baseline VAS and WOMAC scores were assessed. Arthroscopic debridement followed by 8ml of double centrifuged PRP preparation was injected into the joint. VAS and WOMAC were measured before and after the procedure at 1, 3 and 6 month intervals to evaluate the pain and functional outcome. The VAS and WOMAC scores were considered as primary variables and the Age and Sex of the patient were considered as secondary variables. Statistical analysis was done using the IBM SPSS version 17. The results were displayed using appropriate diagrams, tables and bar diagrams.

RESULTS

45 patients have been included in the final study

The mean age of our study group was 51.93 ± 5.99 [Table 1]. Among all, 20 (44.44%) belonged to the age group 56 to 60yrs, 12 (26.66%) belonged to 46-50 yrs, 7 (15.55%) belonged to 41-45 yrs, 5 (11.11%) belonged to 51-55 yrs and 1 (2.22%) belonged to the age group of 15-40 yrs. [Table 2]. Among the study population, 26 (57.77%) of them were female, and 19 (42.22%) of them were male [Table 3]. Among the study population, 25 (55.55%) of them were affected in the right knee, and 20 (44.44%) of them were affected in the left knee [Table 4]. The mean VAS score at pre-op was 7.95 ± 0.76 , it

was 5.77 ± 0.90 Post-op 1 month, it was 4.10 ± 0.77 Post-op 3 months, and it was 2.22 ± 0.99 Post-op 6 months [Table 5, Figure1]. Among the study population, the mean WOMAC score at pre-op was 67.35 ± 7.60 , it was 52.04 ± 8.71 post-op 1 month, it was 42.75 ± 7.28 post-op 3 months, and it was 32.53 ± 3.79 post-op 6 months [Table 6, Figure2]. Among the study population, the median VAS score at pre-op was 8 (7 to 9), it was 6 (5 to 6) at post-op 1 month, 4 (3.5 to 5) at post-op 3 months, and 2 (1 to 3) at post-op 6 months. The median difference between pre-op and post-op (at 1 month, 3 months, 6 months) was statistically significant. P value (<0.001) [Table 7, Figure 3]. In the study population, the median WOMAC score at pre-op was 67 (60 to 75), it was 52 (46 to 60) at post-op 1 month, 42 (36 to 47) at post-op 3 months, and 32 (30 to 35) at post-op 6 months. The median difference between pre-op and post-op 1 month, Post-op 3 months, Post-op 6 months) was statistically significant. P value (<0.001) [Table 8, Figure 4]

Table 1: Descriptive analysis of age in our study population (N=45)

Parameter	Mean $\pm$ SD	Minimum Value	Maximum Value	95% C.I	
				Lower limit	Upper limit
Age	51.93 ± 5.99	40.00	60.00	50.20	53.62

Table 2: Descriptive analysis of age in our study population (N=45)

Age	Frequency	Percentage
35-40	1	2.22
41-45	7	15.55
46-50	12	26.66
51-55	5	11.11
56-60	20	44.44

Table 3: Descriptive analysis of sex in our study population (N=45)

Sex	Frequency	Percentage
Male	19	42.22%
Female	26	57.77%

Table 4: Descriptive analysis of knee involved in the study population (N=45)

Side	Frequency	Percentage
Right	25	55.55
Left	20	44.44

Table 5: Descriptive analysis of VAS score (pre-op and post-op at 1 month, 3 months, 6 months) in the study population (N=45)

Parameter	Mean $\pm$ SD	Minimum	Maximum	95% C.I	
				Lower	Upper
VAS score (Pre-Op)	$7.95 \pm .76$	7	9	7.73	8.17
VAS score (1 month)	$5.77 \pm .90$	4	7	5.51	6.04
VAS score (3 months)	$4.10 \pm .77$	3	5	3.86	4.33
VAS score (6 months)	$2.22 \pm .99$	1	4	1.95	2.51

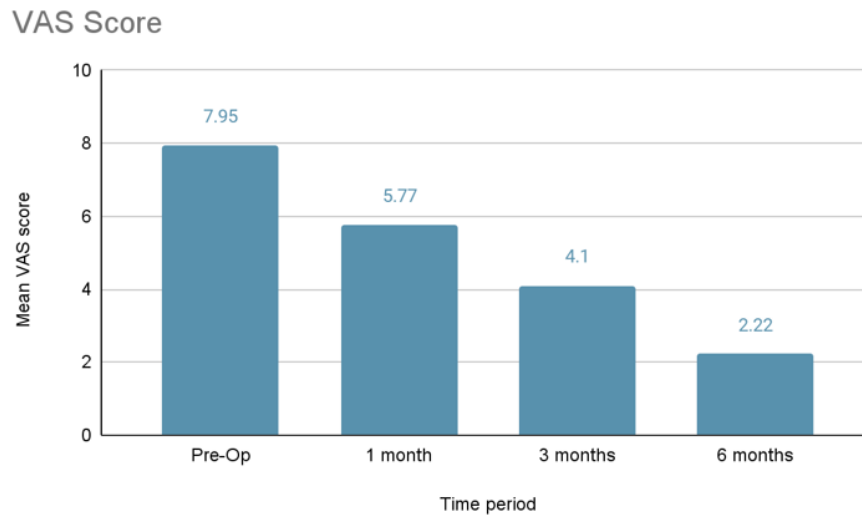


Figure 1: Bar chart depicting VAS score (pre-op and post-op at 1 month, 3 months, 6 months) in the study population (N=45)

Table 6: Descriptive analysis of WOMAC score (pre-op and post-op at 1 month, 3 months, 6 months) in the study population (N=45)

Parameter	Mean $\pm$ SD	Minimum	Maximum	95% C.I	
				Lower	Upper
WOMAC score (Pre-Op)	67.35 $\pm$ 7.60	57	80	65.15	69.68
WOMAC score (1 month)	52.04 $\pm$ 8.71	35	65	49.51	54.55
WOMAC score (3 months)	42.75 $\pm$ 7.28	32	57	40.68	44.97
WOMAC score (6 months)	32.53 $\pm$ 3.79	26	40	31.44	33.62

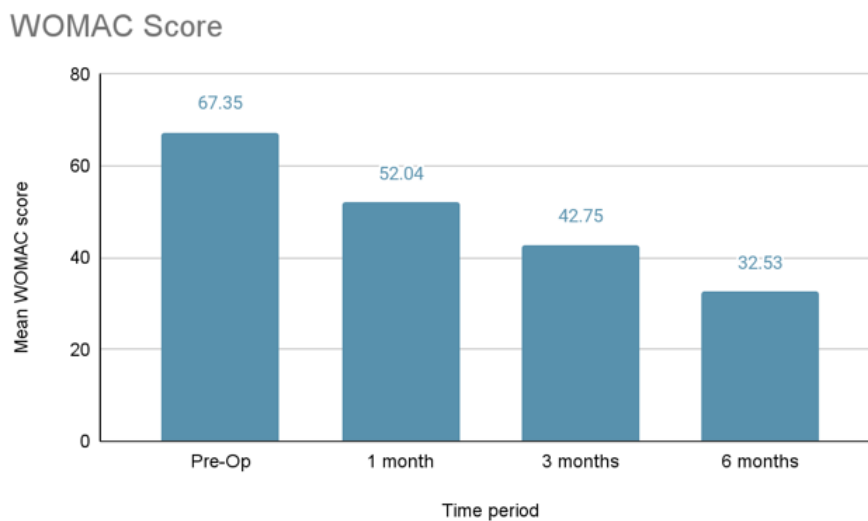


Figure 2: Bar chart depicting WOMAC score (pre-op and post-op at 1 month, 3 months, 6 months) in the study population (N=45)

Table 7: Comparison of pre-op VAS score and post-op at 1 month, 3 months, 6 months VAS score (N=45)

Parameter	Median (IQR)	P value (Wilcoxon signed -Test)
Pre-Op VAS score (Baseline)	8 (7 - 9)	
VAS score (1 month)	6 (5 - 6)	<0.001
VAS score (3 months)	4 (3.5 - 5)	<0.001

VAS score (6 months)	2 (1 - 3)	<0.001
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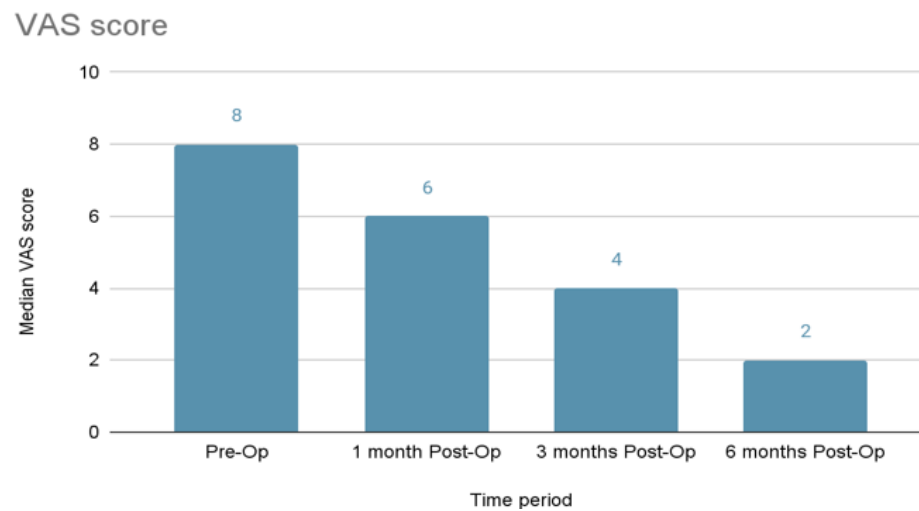


Figure 3: Bar plot for median pre-op VAS score and post-op at 1 month, 3 months, 6 months VAS score (N=45)

Table 8: Comparison of pre-op WOMAC score and post-op at 1 month, 3 months, 6 months WOMAC score (N=45)

Parameter	Median (IQR)	P value (Wilcoxon signed -Test)
Pre-Op WOMAC score (Baseline)	67 (60 - 75)	
WOMAC score (1 month)	52 (46 - 60)	<0.001
WOMAC score (3 months)	42 (36 - 47)	<0.001
WOMAC score (6 months)	32 (30 - 35)	<0.001



Figure 4: Bar plot for median pre-op WOMAC score and post-op at 1 month, 3 months, 6 months WOMAC score (N=45)

DISCUSSION

Arthroscopic procedures for treating OA knees include lavage, synovectomy, partial meniscectomy, and loose body excision. These treatments are carried out in a suitable order and combination according to the features of articular lesions. Arthroscopic techniques can be used to relieve symptoms in the early stages of arthritis, but they are unable to halt the illness from progressing.⁴ An alternative approach to treating OA has been the use of PRP. PRP contains the same collection of cytokines and growth factors that are stored in platelets.¹³ Several studies have demonstrated alleviation of symptoms of knee OA after PRP administration.^{14,15} Kon *et al.*¹⁶ found in his study that there was improvement in knee function and quality of life in addition to pain relief in the short term. PRP treatment also produced superior results in terms of pain, stiffness, and knee function than placebo (saline) in a prospective, randomized, double-blind research on patients with early OA.¹⁷

In this prospective, observational, hospital-based study, 45 patients with knee OA (Grade 2 Kellgren and Lawrence) were diagnosed both clinically and radiologically. The VAS (visual analogue scale) score and the WOMAC (Western Ontario McMaster Universities Arthritis Index) score were regarded as the primary outcome variables. Age and gender were assumed to be the main explanatory variables. The VAS score and WOMAC score indicate that intra-articular PRP injection given after debridement is superior for pain relief and functional improvement six months later in individuals with

symptomatic knee OA.

The mean age of our study group is 51.93 ± 5.99 . This mean age is slightly younger than that of the study of Manco *et al.*¹⁸, which is 52.4 years. King *et al.*¹⁹ study had an even younger study group with a mean age 44.56 ± 12.74 years whereas Vasavilbaso *et al.*²⁰ study had a mean age of 64.4 years. In our study, 56 to 60 years age is the range that accounts for the majority of the patients, followed by 46 to 50 years. 42.22% of the population was male and 57.77% of the population was female in our study hence, our study population is primarily female which is in contrast to Gobbi *et al.*²¹, study in which 62% of the study population was male and King *et al.*¹⁹, study in which 69% of the study population was male and Vasavilbaso *et al.*²⁰ which also had 52% male participants.

In our study, 44.44% of the study population had left side knee OA and 55.55% of them had right side knee OA. King *et al.*¹⁹ found that 52% of his study participants had right knee involvement and 48% had left knee involvement; in contrast, Gobbi *et al.*²¹ found that 40% of his study population had right knee involvement and 60% had left knee involvement.

In our study, a comprehensive clinical examination was conducted, standing anteroposterior and lateral radiographs of the knee joints were acquired, and the Kellegren-Lawrence system was used to classify the severity. The patients with radiologically diagnosed Grade 2 osteoarthritis (Kellgren and Lawrence system) were informed about the procedure and given a choice to become part of the study.

The participants were planned for surgical arthroscopic debridement combined with an injection of platelet-rich plasma in the same joint under arthroscope guidance. Patients were assessed before the procedure (Pre-Op), and one, three, and six months after the procedure (Post-Op). The WOMAC and VAS scores were used to gauge how well the patients had improved functionally and in terms of pain.

The average VAS score in our study was found to have steadily reduced from 7.95 ± 0.76 at pre-op to 5.77 ± 0.90 at 1 month, 4.10 ± 0.77 at 3 months, and 2.22 ± 0.99 at 6 months, indicating a favourable outcome of the surgery in terms of pain and quality of life. At pre-op, the median VAS score was found to be 8 (IQR 7 to 9), at one month it was 6 (IQR 5 to 6), at three months it was 4 (IQR 3.5 to 5), and at six months it was 2 (IQR 1 to 3). With a p value <0.001 , indicating significant improvement in pain score. The median difference between pre and post-operative VAS score (at 1 month, 3 months, and 6 months) was statistically significant. This is in congruence with study by Elik *et al.*²², who found that the PRP group's VAS scores were significantly lower ($p < 0.001$) in the first and sixth months following treatment. According to Gobbi *et al.*²¹, PRP treatment for OA knee following cartilage shaving had positive short-term outcomes without any systemic or local side effects.

Following the findings in the VAS score, the WOMAC score was also assessed and it showed a statistically significant improvement ($p < 0.001$), with the score gradually declining from 67.35 ± 7.60 at the beginning of the study to 52.04 ± 8.71 at one month after the procedure, 42.75 ± 7.28 at three months, and finally 32.53 ± 3.97 at six months after the procedure. Pre-op, the median WOMAC score was found to be 67 (IQR 60 to 75), at 1-month post-procedure, it was 52 (IQR 46 to 60), 3 months later it was 42 (IQR 36 to 47), and 6 months later it was 32 (IQR 30 to 35). Similar results were observed in the study by Kumar *et al.*²³, where the WOMAC score showed improved pain, mobility, and ability in the short-term, post-PRP administration. According to the study by Vasavilbaso *et al.*²⁰, patients receiving PRP in that study were a diverse group that appeared to adhere to the all-or-nothing rule. Those who improved did so significantly, and this improvement persisted until the end of the follow-up but non-responding patients experienced a similar situation, with only 60% of patients meeting the minimally clinically important improvement threshold by the study's conclusion. Dai *et al.*²⁴, in their study, found that PRP injection is superior to saline in terms of pain relief and functional improvement (assessed by WOMAC score) after six and twelve months post-treatment.

CONCLUSION

The study included 45 patients with a mean age of 51.93 ± 5.99 years who were diagnosed with Kellgren and Lawrence grade 2 knee OA. This population is primarily female, with 42.22% males and 57.77% females. In this group, 55.55% of the patients had been diagnosed with Right knee OA, and 44.44% had been identified with Left knee OA. The lesion site was surrounded by an arthroscopic injection of platelet-rich plasma triggered by calcium gluconate following arthroscopic debridement. All of the patients were evaluated in the pre-procedure setting as well as after 1 month, 3 months and 6 months post-procedure. The mean VAS score was found to have steadily dropped from 7.95 ± 0.76 at pre-op to 5.77 ± 0.90 at one month, 4.10 ± 0.77 at three months, and 2.22 ± 0.99 at six months, indicating a positive functional outcome of the treatment in terms of pain. Hence, statistically significant improvement ($p < 0.001$) has been observed in terms of the VAS score. According to the WOMAC score, there has been a statistically significant improvement ($p < 0.001$), with the score falling from 67.35 ± 7.60 at pre-op to 52.04 ± 8.71 at one month, 42.75 ± 7.28 at three months, and finally to 32.52 ± 3.79 at six months.

In our study, short-term effects of arthroscopic debridement with PRP have been discussed with the longest review at 6

months. In the short-term scenario, arthroscopic debridement with PRP has given significantly good results. Hence, study comes to the conclusion that arthroscopic debridement combined with intra-articular PRP injection has demonstrated good outcome in terms of pain alleviation and functional improvement. Additionally, it increases the duration of arthroscopic debridement treatment efficacy in individuals with OA of the knee. The long-term efficacy of this mode of treatment could not be evaluated due to time constraint. The study is also limited with a small sample size and no evaluation for evidence of cartilage regeneration. Future studies need to take into consideration, these limitations and include a larger sample size along with a longer follow-up period.

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