

## Original Research Article

# The role of platelet rich plasma injection in the management of early osteoarthritis of the knee

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## ABSTRACT

**Background:** Osteoarthritis of the knee is a degenerative disorder associated with significant morbidity in the form of pain, knee stiffness and decrease in the functional capacity of the affected limb leading to a decrease in the quality of life for the patient. Various modalities of treatment are available for the management of this condition. The aim of this study was to evaluate the role of platelet rich plasma (PRP) injection in the management of early osteoarthritis of the knee and to compare the functional outcome with the studies of various authors as available in literature.

**Methods:** 60 patients with Kellgren and Lawrence grade 1 and 2 osteoarthritis of the knee were studied from January 2014 to January 2015 and were followed up for a period of 1 year.

**Results:** There were 39 males and 21 female patients in our study with the right side being more commonly affected. There was a significant decrease in the VAS score and the WOMAC score at 1, 3, 6 and 12 months follow up as compared to the pre-injection baseline scores. All patients were satisfied with the procedure in terms of functional outcome.

**Conclusions:** PRP injection is a cost effective, safe and efficient procedure with easily reproducible results and gives good functional results in terms of pain relief, improvement of range of movements and mobility, and improves the quality of life in patients with early osteoarthritis of the knee.

**Keywords:** Osteoarthritis, PRP, Injection, WOMAC

## INTRODUCTION

Primary Osteoarthritis of the knee is one of the most common degenerative disorders seen which is characterized by destruction of the articular cartilage with structural changes in the subchondral bone and the synovium. It is a major cause of disability globally causing pain, decrease in range of movements and function of the affected knee leading to a reduction in the quality of life and work ability of the patient.<sup>1</sup> It is associated with factors such as age of the patient, Body mass index and the strain applied on the knee by constant weight bearing, kneeling and squatting. The aims of treatment in this condition are to relieve pain, improve

the range of movement of the knee, restore function and to improve the quality of life for the patients affected. Various treatment modalities are available for its management. Total knee arthroplasty is the most effective treatment in the management of osteoarthritis of the knee but not all patients are suitable candidates for the same. It is generally reserved for patients in an older age group with signs of tri compartmental arthritis.<sup>2</sup> There exists a group of younger patients with early osteoarthritis of the knee who would need conservative management for which various modalities such as analgesics, physiotherapy, oral chondro protectives like glucosamine and chondroitin sulphate, viscosupplementation and intra articular steroid injections are available.<sup>3-11</sup>

All of them are associated with varying degrees of success in the management of this condition. There has long been a need for a form of treatment for early osteoarthritis in younger patients which is safe, cost effective, without adverse effects which gives good results in the form of a good functional outcome and PRP has emerged as a frontrunner in this case as demonstrated by various clinical trials and studies.<sup>12,13</sup> Platelet rich plasma (PRP) is a natural concentrate of autologous growth factors from the blood. The method is simple, cost effective and minimally invasive. The utilization of PRP in degenerative knees could bring about a stimulation of chondral anabolism increasing the cartilage thickness and reduce the catabolic process. PRP may also influence the overall joint homeostasis and reduction in the joint pain caused by the degenerated knee. The aim of this study was to evaluate the role of PRP injection in the management of early osteoarthritis of the knee.

## METHODS

60 patients with early osteoarthritis of the knee were studied at the Department of Orthopaedics, Saveetha medical college and hospital, Thandalam from January 2014 to January 2015. Patients with Kellgren and Lawrence grade 1 and 2 osteoarthritis of the knee with chronic pain or swelling of the knee for at least 4 months with no response to analgesics or physiotherapy, patients giving consent for the procedure and patients willing for follow up were included in our study. Patients with grade 3 and 4 osteoarthritis of the knee, patients with Rheumatoid arthritis, haematological diseases, infection and immunocompromised patients were excluded from our study. Routine blood investigations were done in all patients and X rays of the affected knees were taken in Antero posterior standing and lateral views. Before the injection, a thorough physical examination of the knee was done and the range of movements was recorded. The patient's pre-injection visual analogue score (VAS) and The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) baseline scores were recorded and documented in the case record. The VAS score is numbered from 0 which represents no pain to 10 which is worst possible, unbearable excruciating pain. The WOMAC score deals with parameters such as pain, stiffness and physical function. Approximately 30 ml of blood sample was withdrawn in sterile EDTA containers and was centrifuged twice. First centrifugation was at 1800 rpm for 15 minutes to separate erythrocytes and second centrifugation was at 3500 rpm for 10 minutes to concentrate platelets. The resultant concentrate obtained was the autologous platelet rich plasma of 3-5 ml. Once the concentrate was prepared, it was injected in the affected knee within 2 hours. The injection was done in an operating room with the affected knee painted and draped in the standard manner. The injection was made through the lateral approach using a 22 gauge needle. At the end of the procedure, the patients were instructed to flex and extend the knee a few times to allow the PRP to distribute itself throughout the knee before becoming the

gel form. The patients were sent home within 24 hours with instructions to limit the use of the leg for at least 48 hours and to use cold therapy / ice on the affected area of pain. During this period, the use of nonsteroidal medication was forbidden. Patients could return to their mild daily activities such as walking and sport activities can be performed as tolerated. Patients were asked to review for follow up at 1, 3, 6 and 12 months and VAS and WOMAC scores were recorded and documented in the case records (Table 1). The data collected was analyzed using IBM SPSS Version 22.0. Armonk, NY:IBM Corp. Chi square test was used in the comparison of categorical variables. A P value of less than 0.05 was considered to be statistically significant.

**Table 1: WOMAC scoring system.**

Parameters				
<b>Pain</b>				
Walking	0	1	2	3 4
Stair climbing	0	1	2	3 4
Nocturnal	0	1	2	3 4
Rest	0	1	2	3 4
Weight bearing	0	1	2	3 4
<b>Stiffness</b>				
Morning stiffness	0	1	2	3 4
Stiffness occurring later in the day	0	1	2	3 4
<b>Physical function</b>				
Descending stairs	0	1	2	3 4
Ascending stairs	0	1	2	3 4
Rising from sitting	0	1	2	3 4
Standing	0	1	2	3 4
Bending to floor	0	1	2	3 4
Walking on flat surface	0	1	2	3 4
Getting in /out of car	0	1	2	3 4
Going shopping	0	1	2	3 4
Putting on socks	0	1	2	3 4
Lying in bed	0	1	2	3 4
Taking off socks	0	1	2	3 4
Rising from bed	0	1	2	3 4
Getting in/out of bath	0	1	2	3 4
Sitting	0	1	2	3 4
Getting on/off toilet	0	1	2	3 4
Heavy domestic duties	0	1	2	3 4
Light domestic duties	0	1	2	3 4
<b>Total score: _ /96 points</b>				

Scale of difficulty: 0=None, 1=Slight, 2=Moderate, 3=Very, 4=Extremely

## RESULTS

60 patients with grade 1 and 2 osteoarthritis of the knee treated with intra articular PRP Injection were studied from January 2014 to January 2015 and were followed up for a period of 1 year. There were 39 males and 21 female patients in our study (Figure 1). The right side more commonly involved in 37(61.6%) of the patients (Figure

2). The age of the patients ranged from 38 to 68 years with average age being  $48 \pm 2.1$  years. The mean body mass index was  $29.4 \pm 3.7$  ranging from 22.4 to 35.6. There was no statistical significance regarding age, sex, side or body mass index. The knees were graded according to the Kellgren and Lawrence classification with 32 patients having grade 1 arthritis and 28 patients with grade 2 (Table 2). The approximate amount of PRP injected was around 3-5 ml. Blood analysis was done before and after the process of centrifugation and it was observed that the mean value of platelet count in the whole blood was  $140 \pm 24 \times 10^6$  platelets/ml while it was  $640 \pm 128 \times 10^6$  in the PRP. The white blood cell count was increased in concentration by 3.4 fold while the red blood cell count had decreased by 38%. The pre injection VAS score was  $8.09 \pm 1.45$  while it was reduced to  $4.96 \pm 1.49$  in 6 months and  $2.90 \pm 1.37$  at the end of 12 months which was statistically significant ( $p < 0.0005$ ). The pre injection WOMAC score was  $81 \pm 3.6$  which decreased to  $63 \pm 4.2$  at 3 months and  $42 \pm 1.9$  at the end of 12 months follow up which was statistically significant as well ( $p < 0.0005$ ) (Table 3). The patients had a good functional outcome in terms of pain relief, improvement in range of movement of the knee and an improvement in the quality of life. There were no side effects or complications seen in our study. Following injection of PRP, 4 patients complained of worsening of pain initially which eventually settled down within 3 days. None of our patients were lost to follow up.

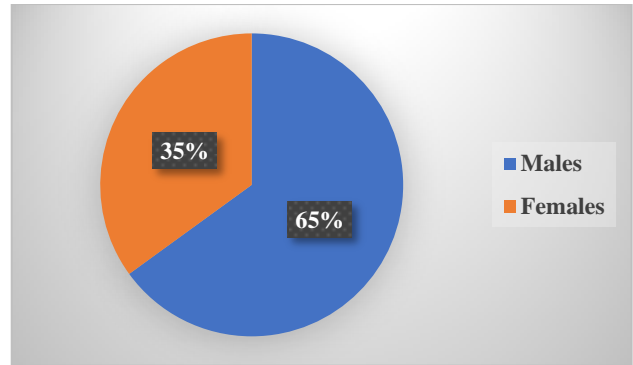


Figure 1: Sex incidence.

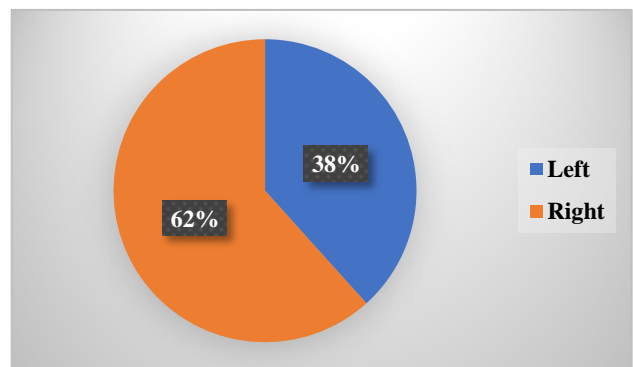


Figure 2: Side dominance.

Table 2: Grading of osteoarthritis.

Grade	Number of patients	Percentage (%)
1	32	53.3
2	28	46.6

Table 3: Results of scores.

Score	Pre-injection	1 month	3 months	6 months	12 months
VAS	$8.09 \pm 1.45$	$6.12 \pm 1.21$	$5.23 \pm 1.41$	$4.96 \pm 1.49$	$2.90 \pm 1.37$
WOMAC	$81 \pm 3.6$	$71 \pm 3.8$	$63 \pm 4.2$	$54 \pm 4.7$	$42 \pm 1.9$

**DISCUSSION**

Osteoarthritis of the knee is a disabling condition which is usually associated with considerable morbidity for the affected individuals in the form of pain, decrease in range of movement and mobility resulting to a decrease in the quality of life and also works related activity. In patients with grade 1 and 2 arthritis, conservative management is the treatment of choice and various modalities are available for the same such as analgesics, physiotherapy, chondroprotectives, viscosupplementation and intra articular steroid injections. All of them have been used in the treatment of early osteoarthritis with varying degrees of success. At present PRP has been gaining in popularity due to the fact that it gives good results in terms of functional outcome to the patients as demonstrated by various clinical trials. Platelets contain many important

bioactive proteins and growth factors. These factors regulate key processes in tissue repair, including cell proliferation, chemotaxis, migration, cellular differentiation and extracellular matrix synthesis. The rationale for the use of PRP is to stimulate the natural healing cascade and tissue regeneration by a supraphysiologic release of platelet derived growth factors directly at the site of treatment. Platelets which are extracted will normally be activated by thrombin into a PRP gel form which have a halflife of a few minutes to hours. When PRP solutions are injected directly at the site of treatment, platelets are activated by endogenous thrombin and/or intra articular collagen. The growth factors mediate the biological process necessary for repair. PRP brings about its effect in osteoarthritis by stimulating cartilage matrix metabolism.<sup>14-17</sup> Since it is autologous, there is no risk of allergic reactions or disease

transmission. There are no side effects. It is simple to administer, minimally invasive and gives good functional results which are easily reproducible.

In our study the pre injection VAS score was  $8.09 \pm 1.45$  while it was reduced to  $4.96 \pm 1.49$  in 6 months and  $2.90 \pm 1.37$  at the end of 12 months. The pre injection WOMAC score was  $81 \pm 3.6$  which decreased to  $63 \pm 4.2$  at 3 months and  $42 \pm 1.9$  at the end of 12 months follow up. All patients had a good functional outcome in terms of good pain relief, improvement in the range of movements and mobility and overall improvement in the quality of life. We compared our study with that of other authors and we noted that most of the studies had good functional results following the PRP injection which compared well with that of ours.<sup>18-21</sup> All the patients were happy with the outcome following PRP injection and there were no patients who were dissatisfied with the results. The limitations of our study were lack of a placebo/control group and a relatively short follow up period. A longer follow up period is necessary to observe if the beneficial effects of PRP are sustainable over a long term period. We thereby conclude by stating that intra articular injection of PRP is a safe and cost effective procedure which considerably improves the quality of life in patients with early osteoarthritis of the knee.

## CONCLUSION

By this study, we conclude that PRP injection is a simple, cost effective, safe and efficient procedure with easily reproducible results and gives good functional outcomes in terms of pain relief, improvement of range of movements and mobility, and significantly improves the quality of life in patients with early osteoarthritis of the knee.

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