

Efficacy of Intra-articular Platelet-rich Plasma in Patients of Knee Osteoarthritis

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ABSTRACT

Objective: To evaluate the efficacy of autologous intra-articular platelet-rich plasma (PRP) injections in patients of knee osteoarthritis.

Methodology: This was a prospective study carried out on 50 patients (10 males & 40 females) visiting the outpatient department of Orthopedics Surgery, Sharif Medical City Hospital, Lahore. The study was approved by the ethical committee of the institution. The patients fulfilling the inclusion criteria were asked to fill Western Ontario and McMaster Osteoarthritis criteria (WOMAC) questionnaire. Informed written consent was taken from the patients. Using aseptic techniques, PRP was injected intra-articularly in the affected knee. Three PRP injections were given intra-articularly at 1 week intervals. Patients were regularly followed up after 3 weeks, 6 weeks, 3 months, 6 months and 1 year of the last PRP injection. Each parameter of the WOMAC index was compared with the baseline score at each follow-up. The data obtained was analyzed using SPSS software version 25.

Results: The mean age of the patients was 50.82 ± 8.6 years; male to female ratio was 1:4. According to the Kellgren-Lawrence scale, 5(10%) patients had grade I, 16(32%) patients had grade II and 29(58%) patients had grade III osteoarthritis. The mean score of all WOMAC parameters improved significantly as compared to the baseline score before the treatment. There was a significant improvement in joint pain, stiffness and functional ability after PRP injections.

Conclusion: Intra-articular injections of autologous platelet-rich plasma in osteoarthritic knee joint are effective in relieving joint pain & stiffness and improve the functional capacity in the patients of knee osteoarthritis.

Keywords: Platelet-rich plasma. Knee osteoarthritis. WOMAC index.

INTRODUCTION

Osteoarthritis is a chronic inflammatory condition of synovial joint in which degeneration of articular cartilage occurs. It adversely affects the quality of life of the patient.¹ The cartilage is avascular and the cells have low mitotic activity. So, healing potential is limited in cartilage and eventually it leads to irreversible damage. Knee joint osteoarthritis is one of the most common musculoskeletal disorders of old age. The main symptoms of knee osteoarthritis are knee pain, stiffness, swelling and functional disability.^{2,3}

Different treatment options are used for symptomatic relief of the patient with knee osteoarthritis (OA) like oral chondroprotective drugs, pain killers, intra-articular steroids injections but no treatment modality can cure osteoarthritis.^{4,6}

Platelet-rich plasma has emerged as a new treatment option for patients with knee OA due to the presence of various growth factors like transforming growth factor- β (TGF- β), platelet-derived growth factor (PDGF) and insulin-like growth factor (IGF) in the α -granules of the platelets.^{7,8} Platelet-rich plasma is a portion of plasma which contains four to five times higher platelet

concentration than the normal platelet count in a healthy person.^{9,10}

The National Institute for Health and Care Excellence (NICE) recommended "Current evidence on platelet-rich plasma injections for knee osteoarthritis raises no major safety concerns. However, the evidence on efficacy is limited in quality. Therefore, this procedure should only be used with special arrangements for clinical governance, consent and audit or research".¹¹

Various international studies showed the positive effects of PRP on knee OA. The patients showed a significant improvement in symptoms and their functional ability after PRP injections.¹²⁻¹⁴ Platelet-rich plasma is a better treatment modality as compared to hyaluronic acid (HA).^{8,9,15} Growth factors are released from PRP immediately and last for about three weeks. This sustained release of growth factors from PRP helps in cartilage healing thus improving the clinical condition of the patient.¹⁶

Osteoarthritis of the knee joint is a common chronic disorder associated with significant morbidity. Despite a variety of non-surgical treatments, the patient experience pain with limited physical activity. There are still a few randomized controlled studies which clarify the effectiveness of optimal therapy of platelet-rich plasma after 1 year. This study was planned to evaluate the efficacy of 3 PRP injections with one week intervals on the functional ability of the patient with follow-up of 1 year.

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METHODOLOGY

This was a prospective study carried out on 50 patients (10 males & 40 females) visiting the outpatient department of Orthopedics Surgery, Sharif Medical City Hospital, Lahore. The study was approved by the ethical committee of the institution and consecutive sampling technique was used. The patients of age ≥ 40 years with knee pain for greater than 3 months and radiologic evidence of articular damage (grades 1-3 of Kellgren-Lawrence scale) were enrolled in our study. Kellgren-Lawrence scale is based on criteria of the American College of Rheumatology and is shown in figure 1.

Patients with secondary osteoarthritis, systemic diseases like rheumatic diseases, coagulation disorders, severe cardiovascular diseases, immune suppression,

malignancy, infection or active wound of the knee were excluded from the study.

The patients fulfilling the inclusion criteria were asked to fill the WOMAC questionnaire. In patients with osteoarthritis of both knee joints, the worse affected knee joint as per WOMAC score (higher score) was selected and in patients with osteoarthritis of the single knee joint the same affected knee joint was selected. Plain radiograph of the selected knee joint was done (standing anteroposterior and lateral view). Each parameter of the WOMAC index was compared with the baseline score at each follow-up. Figure 2 shows the WOMAC index.

Using aseptic technique, 30 ml of venous blood was drawn from the antecubital vein of the patient in the Pathology Laboratory and collected in three 10 ml

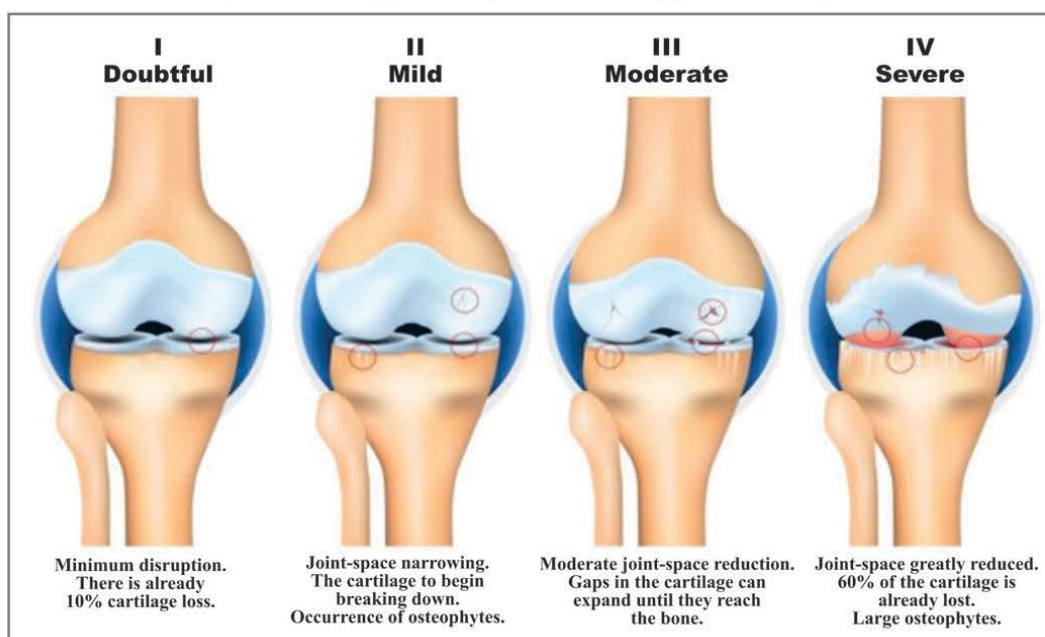


Figure 1: Grades of Knee Osteoarthritis Based on the Kellgren-Lawrence Scale

WOMAC index

WOMAC index

- 0 : not any
1 : a little
2 : moderate
3 : important
4 : very important - extreme

P Subscale :

How much pain do you have:

- 1: walking on flat surface
2: going up or down stairs
3: at night while in bed
4: sitting or lying
5: standing upright

S Subscale :

How severe is your stiffness

- 1: After first wakening in the morning
2: After sitting lying or resting later in the day

PF Subscale :

What degree of difficulty do you have

- 1: descending stairs
2: ascending stairs
3: rising from sitting
4: standing
5: bending to floor
6: walking on flat
7: getting in / out of car
8: going shopping
9: putting on socks / stockings
10: rising from bed
11: taking off socks / stockings
12: lying in bed
13: getting in / off bath
14: sitting
15: getting on / off toilet
16: heavy domestic duties
17: light domestic duties

Figure 2: WOMAC Index for Patients Assessment

vacutainer containing 1 ml of 3.2% sodium citrate as an anticoagulant. Platelet-rich plasma was prepared by the soft and hard spin method. The final product of 5-6 ml of PRP was obtained and it was injected intra-articularly in the affected knee on the same day. Platelet count assessment was done initially in the whole blood as well as in PRP in all the patients.

After taking informed written consent, the patient was shifted to the operation theatre. The patient was placed in the supine position. Under the aseptic conditions, 4-5ml of PRP was injected in the knee through an anterolateral approach using 22 gauge needle with local anesthetic injection lignocaine 2%. No exogenous factor was used for platelet activation. The aseptic dressing was done by the bandage. Three PRP injections were given intra-articularly at 1 week intervals. Patients were regularly followed up after 3 weeks, 6 weeks, 3 months, 6 months and 1 year after the last PRP injection. At each visit, the assessment was done using the WOMAC questionnaire.

STATISTICAL ANALYSIS

The data obtained was analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. The quantitative variables were measured as mean \pm SD. Qualitative variables were shown as frequencies and percentages. Paired t-test was used to compare mean values of pretreatment and

posttreatment WOMAC index parameters. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

The mean age of the patients was 50.82 ± 8.6 years; male to female ratio was 1:4. According to the Kellgren-Lawrence scale, 5(10%) patients had grade I, 16(32%) patients had grade II and 29(58%) patients had grade III osteoarthritis.

The baseline score of WOMAC index parameters (pain, stiffness & physical function) was compared with mean values after 1 year of completion of treatment. Our results showed that all the parameters were improved on the subsequent follow-up visit. A statistically significant difference (p-value=0.001) was found when the pretreatment pain score was compared with mean pain score at follow-up after 1 year. Joint stiffness and physical functioning of the joint also improved significantly after 1 year of treatment (p-value < 0.001).

Table 1 shows the mean value of the baseline WOMAC index parameter with the posttreatment score calculated after 6 months and 1 year of treatment. Four patients (8%) developed mild pain and swelling of the knee joint after injection which resolved spontaneously within 3 days by rest and ice application. Infection was not reported in any patient.

Table 1: Baseline and Posttreatment WOMAC Index Parameters

Parameter	Mean Score		
	Pretreatment	6 Months Posttreatment	1 Year Posttreatment
Pain	12.8 \pm 1.9	6.5 \pm 1.1	7.5 \pm 1.5
Stiffness	5.6 \pm 0.8	2.9 \pm 0.5	2.6 \pm 0.7
Physical Function	39.5 \pm 5.4	17.9 \pm 3.5	20.4 \pm 2.3

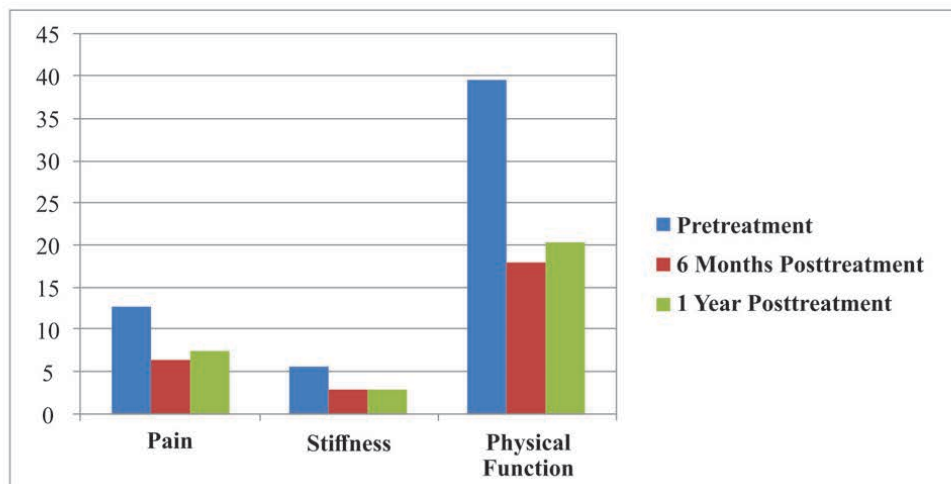


Figure 3: WOMAC Index Parameters Before and After Treatment with PRP Injections

DISCUSSION

Osteoarthritis of the knee joint is the most common inflammatory degenerative joint disorder. Treatment of osteoarthritis has relied on symptomatic interventions. The goals of a therapeutic approach in knee osteoarthritis are to alleviate pain and improve the functional capacity of joint.¹⁻³

Platelet-rich plasma is the new upcoming treatment modality for the patients with knee osteoarthritis. Cartilage has a very limited self-regeneration capacity. Growth factors released from platelets aid in the regeneration of cartilage and decrease the inflammation. Our results showed that three PRP injections after 1 week intervals significantly improved pain, reduced the stiffness and improved the functional ability of the knee. Sanchez et al. found that PRP was more effective than hyaluronic acid injections.¹⁷

A study conducted by Kon et al. included fifty patients of knee OA. They were treated with 3 intra-articular injections of PRP and were examined after 2 & 6 months. The results were compared with two groups of patients treated with hyaluronic acid injections. Group I was managed with high molecular weight hyaluronic acid and group II was given low molecular weight hyaluronic acid injection. Patient satisfaction and the effects of therapy were also recorded. Follow-up of the patients after 6 months showed that PRP injections had better results as compared to hyaluronic acid HA.¹⁴

Other studies conducted by Smith et al. and Tietz et al. also showed that in patients with knee osteoarthritis pain was significantly reduced by autologous PRP injections.^{18,19} Vaquerizo et al. showed that intra-articular injections of PRP had better results as compared to hyaluronic acid in primary and secondary efficacy analysis both at 24 and 48 weeks. Patients had a significant clinical improvement, reduced pain and improved joint stiffness.²⁰

A study conducted by Jubert et al. included 75 patients with advanced knee osteoarthritis. It showed that even a single intra-articular injection of PRP can relieve pain and improve physical function of joint.²¹

According to our results, the WOMAC index significantly improved in the follow-up after treatment as compared to the baseline score. These results indicated the symptomatic relief and functional recovery in patients after 6 months and 1 year of PRP injections. Similar results were found in a study conducted to validate the outcomes of PRP injections in patient of knee osteoarthritis after 6 months & 12 months of treatment. Clinical outcomes and WOMAC score were significantly better after PRP injections and resulted in significant clinical improvements up to 12 months post-injection.¹⁶

Our study showed that it is safe and feasible to use PRP injections in the treatment of knee osteoarthritis. The

outcome was measured in all patients undergoing the treatment at follow-up after 1 year. Platelets rich plasma significantly reduces the pain and stiffness and increases the functional capacity of the knee joint.

CONCLUSION

Intra-articular injections of autologous platelet-rich plasma (PRP) in osteoarthritic knee joint are effective in relieving joint pain & stiffness and improve the functional capacity in the patients of knee osteoarthritis.

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