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Original Research Article

A COMPARATIVE STUDY OF PLATELET-RICH PLASMA VERSUS HYALURONIC ACID INJECTIONS FOR THE TREATMENT OF KNEE OSTEOARTHRITIS

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ABSTRACT

Background: Osteoarthritis (OA) is an age-related condition that will bring about pain and reduce the capacity to work in about half the population. The aim of this study was to evaluate the benefit provided by PRP to treat early stages of joint degeneration in comparison with another injective treatment: Hyaluronic acid (HA). **Materials and methods:** The patients presenting to Orthopaedic OPD were enrolled after satisfying inclusion criteria. Patients were divided into 2 different treatment groups: those receiving 3 weekly intra-articular injections of PRP versus those receiving high-molecular-weight HA 3 weekly administrations. Patients were prospectively evaluated on 1st day in OPD and subsequently at follow-up on 2, 6, and 10 months after the last injection. The evaluation was done by assessing various scores like the International Knee Documentation Committee (IKDC) subjective measure score, Knee injury, and osteoarthritis outcome score (KOOS), visual analog scale (VAS). **Results:** A total of 50 patients were enrolled in the study. 25 patients were put in group A and received PRP. Another 25 patients were put in Group B and received HA injections. Both the groups were matched for age, sex, and grade of Osteoarthritis knee. A statistically significant improvement in the various clinical scores in both groups was documented. **Conclusions:** This study shows that leukocyte-rich PRP offers a modest clinical benefit at short term. Both treatments were effective in improving knee functional status and symptoms over time. PRP did not show significant improvement in symptoms as compared to HA.

Keywords: Platelet Rich Plasma, Hyaluronic Acid, Osteoarthritis

INTRODUCTION

Osteoarthritis (OA) is a common condition that will affect almost half the population at some point in their lives through pain and decreased functional capacity.**(1)** The treatment options vary according to the stage of the disease progression. In the late stage, most commonly knee replacement surgery is done using a metal prosthesis.**(2)** However, there has been upcoming interest in the use of newer orthobiologics like platelet-rich plasma (PRP) for the use of treatment of osteoarthritis knee. **(3)**

PRP is an innovative method for management of osteo-arthritic joints, which is minimally invasive and allows a quick return to normal activity of the affected joints. PRP is derived from blood which aims to use the various factors found in platelets by concentrating them. **(3)** The activated platelets release many growth factors that bind to the transmembrane receptors of their target cells, thus causing production of gene sequences which will lead to cellular recruitment, growth, and morphogenesis and modulate inflammation as well. **(4)**

In spite of the fact that there are no clear guidelines, early clinical results have been positive. This has led

many clinicians to use PRP for patients of osteoarthritis as a novel therapeutic approach which can be incorporated in the treatment options as an alternative to more traditional injective treatments, such as Hyaluronic acid (HA) and corticosteroids. **(5)** Various trials available show that intra-articular PRP produces better outcome than placebo, but not many studies have compared PRP with corticosteroids. There has been no clear documentation of comparison of PRP with HA, which remains the most commonly used compound for intra-articular application. **(6)**

Thus, the aim of this study was to evaluate the benefit provided by PRP to treat early stages of joint degeneration in comparison with another injective treatment: Hyaluronic acid (HA). The hypothesis was that PRP would provide superior clinical results with respect to visco-supplementation for up to 10 months.

MATERIAL AND METHODS

After approval from the Institutional ethics committee, the prospective study was conducted on the patients presenting to the OPD of the Department of Orthopaedics, Rajindra Hospital, Patiala from June 2018 to May 2019. The inclusion criteria of the patient was based according to the following:

Unilateral symptomatic knee and complaint of chronic pain (minimum 4 months) or swelling.

Radiological findings of cartilage degeneration, suggestive of either chondropathy (Kellgren-Lawrence score of 0, detected by MRI) or osteoarthritis (Kellgren-Lawrence score of 1-3, detected by X-ray).

The patients which were excluded from our study were age ≥80 years, Kellgren-Lawrence score >3, major axial deviation (varus or valgus), focal cartilage or osteochondral lesion, presence of any simultaneous knee lesion causing pain or swelling (like ligamentous or meniscal injury), inflammatory arthropathy, haematological diseases, severe cardiovascular diseases, infections, immunodepression, therapy with anticoagulants or anti-platelets, and hemoglobin count lower than 11 g/dL and platelet count lower than 150,000/mm3.

After taking informed written consent from each patient, the patients were divided into 2 different treatment groups: Group A and Group B. Group A has patients who were given weekly intra-articular injections of PRP and age and gender matched patients of group B were given weekly administration of high-molecular-weight HA. When the patients had received the injections and were ready to go home, they were instructed to restrict the use of the lower limb for at least 1 day and to use ice or other cold packs on the affected knee to relieve pain, if necessary. The treatment consisted of giving 3 intra-articular injections at 1-week intervals. During the treatment period, rest or mild activities were permitted, and subsequently, a gradual resumption of normal activities was allowed as tolerated.

The patients in Group A received 5 ml of PRP containing Calcium chloride as activator. For preparing 5 ml of PRP, 50 ml of blood was collected from the ante-cubital vein and 2 ml of ACDA (acid citrate dextrose) was added. One ml of blood sample was sent for complete blood count. The rest of the sample passed the 2 stages of centrifugation (1st with 1600 rpm for 15 minutes which resulted in separation of erythrocyte layer and subsequent centrifugation at 2800 rpm for 7 minutes which caused concentration of platelets). The final product underwent quantification and qualification using laboratory analyser sysmex KX21 and if approved, the PRP was injected intra-articularly to the affected knee using all aseptic precautions by standard procedure. Group B was designated to receive 5 ml of high molecular weight HA, given weekly for three weeks. This injection was given intra-articularly using aseptic technique and standard procedure.

Patients were prospectively evaluated on 1st day in OPD and subsequently at follow-up on 2, 6, and 10 months after the last injection. The evaluation was done by assessing various scores like International Knee Documentation Committee (IKDC) subjective measure score, Knee injury and osteoarthritis outcome score (KOOS), visual analog scale (VAS).

The data collected was analysed using Microsoft Excel 2018. Descriptive statistics was applied to the demographic data and to various scores. Scores were expressed as mean ± standard deviation and statistical analysis was done using unpaired Student's t-test. A p-value < 0.05 was considered to be statistically significant.

RESULTS

A total of 50 patients were enrolled in the study. 25 patients were put in group A and received PRP. Another 25 patients were put in Group B and received HA injections. Both the groups were matched for age, sex and grade of Osteoarthritis knee (Table 1).

There was statistically significant improvement in the IKDC scores in group A (Fig 1). In particular, the IKDC subjective score increased at two-month follow-up. This increase was significant ($p<0.001$). Thereafter, it remained stable for up to 12 months ($p=0.37$ at 12 months vs 2 months). In Group B patients (who were receiving Hyaluronic Acid), similar statistically significant improvement in IKDC scores was found. This increase was seen with maximum improvement at 2 months ($p<0.001$). However, very little further improvements were seen after this up to 12 months ($p=0.41$ at 12 months vs 2 months).

In group A, an increase was recorded in all KOOS subscales in group A (Table 2). Similar increase was recorded in all KOOS subscales in group B patients.

The VAS score for pain revealed a significant improvement from baseline to the conclusion of study, with improvement of pain score from 7 to 5 in both Group A and Group B patients.

Mild swelling and pain was complained of by a few patients receiving PRP. However, this effect was self-limiting and improved after a few days of rest, ice and use of NSAIDs. No major adverse effects were reported which required hospitalization or other intervention. No significant side effects were seen in any patient receiving HA injections.

DISCUSSION

The outcome of this randomized study failed to show any significant benefit of PRP over HA injections for the treatment of stages 1,2,3 of OA knee. Patients were evaluated for 10 months, and the results were analyzed at different follow-ups through several questionnaires. Although significant clinical improvement was observed after treatment in both groups, no significant difference was found in using PRP with respect to visco-supplementation in any evaluation performed at any of the follow-up times. Finally the benefit obtained by giving injections was only partial (ie, swelling of knee joint was reduced but associated with little symptomatic and functional improvement). This was seen in both PRP and HA administration. Thus it questions the usefulness of giving these treatments. This brings up the controversial issue regarding the efficacy of viscosupplementation. This become more debatable since some recent studies have even raised questions about the real potential of HA. **(7)**

Currently viscosupplementation is not officially recommended either by the American Academy of Orthopaedic Surgeons or by the Osteoarthritis Research Society International guidelines for the management of knee OA. Initial studies have shown that PRP intra-articular injections are safe. They can reduce pain and improve knee function and quality of life. These effects are more pronounced in younger patients who have a milder degree of cartilage degeneration. **(8)**

The findings reported in the present study do not have the strength to consider that PRP is clearly superior to HA, given that no significant intergroup difference was found in the overall effect duration and in the scores applied. Similarly, no other differences were found in clinical scores between PRP and HA groups during the evaluation up to 10 months. However, these findings might not be representative of the potential benefit provided by other PRP treatments. PRP treatment can act at many levels which may change the secreted molecules. This may influence the effects produced in the joints under treatment and the resulting clinical outcome. **(9)**

Sa´nchez et al looked at the efficacy of leukocyte-free PRP when compared with HA in 153 patients at 6 months of follow-up. They concluded that PRP injections to the knee produced superior benefits. **(10)** However, the most definitive advantage of PRP was that most patients had at least 50% pain reduction. But the study did not show that PRP had greater efficacy than HA. Similar results on 96 patients treated with the same blood derivative were documented by Vaquerizo et al, who performed a randomized but not blinded trial against HA. **(11)**

CONCLUSIONS

This study shows that leukocyte-rich PRP offers a modest clinical benefit at short term. Both treatments were effective in improving knee functional status and symptoms over time. PRP did not provide an overall superior clinical improvement compared with HA. Therefore, PRP should not be preferred to viscosupplementation as injective treatment for patients affected by cartilage degeneration and OA.

REFERENCES

1. Johnson VL, Hunter DJ. The epidemiology of osteoarthritis. Best Pract Res Clin Rheumatol 2014; 28: 5-15.
2. Gomoll AH, Filardo G, Almqvist FK, et al. Surgical treatment for early osteoarthritis, part II: allografts and concurrent procedures. Knee Surg Sports Traumatol Arthrosc 2012; 20: 468-86.

3. Spakova´ T, Rosocha J, Lacko M, Harvanova´ D, Gharaibeh A. Treatment of knee joint osteoarthritis with autologous platelet-rich plasma in comparison with hyaluronic acid. Am J Phys Med Rehabil 2012; 91:411- 7.
4. Anitua E, Sa´nchez M, Orive G. Potential of endogenous regenerative technology for in situ regenerative medicine. Adv Drug Deliv Rev 2010; 62: 741-52.
5. Bannuru RR, Schmid CH, Kent DM, Vaysbrot EE, Wong JB, McAlindon TE. Comparative effectiveness of pharmacologic interventions for knee osteoarthritis: a systematic review and network meta-analysis. Ann Intern Med 2015; 162:46-54.
6. Di Martino A, Di Matteo B, Papio T, Tentoni F, Selleri F, Cenacchi A, Kon E, Filardo G. Platelet-Rich Plasma Versus Hyaluronic Acid Injections for the Treatment of Knee Osteoarthritis. Results at 5 Years of a Double-Blind, Randomized Controlled Trial. Am J Sports Med 2019; 47: 347-54.
7. Mandl LA, Losina E. Relative efficacy of knee osteoarthritis treatment: Are all placebo's created equal? Ann Intern Med 2015; 162:71-2.
8. Filardo G, Kon E, Roffi A, Di Matteo B, Merli ML, Marcacci M. Platelet-rich plasma: why intra-articular? A systematic review of pre-clinical studies and clinical evidence on PRP for joint degeneration. Knee Surg Sports Traumatol Arthrosc 2015; 23: 2459-74.
9. Fitzpatrick J, Bulsara MK, McCrory PR, Richardson MD, Zheng MH. Analysis of platelet-rich plasma extraction: variations in platelet and blood components between 4 common commercial kits. Orthop J Sports Med 2017; 5: 2325967116675272.
10. Sa´nchez M, Fiz N, Azofra J, et al. A randomized clinical trial evaluating plasma rich in growth factors (PRGF-Endoret) versus hyaluronic acid in the short-term treatment of symptomatic knee osteoarthritis. Arthroscopy 2012; 28: 1070-8.
11. Vaquerizo V, Plasencia MA´, Arribas I, et al. Comparison of intra-articular injections of plasma rich in growth factors (PRGF-Endoret) versus Durolane hyaluronic acid in the treatment of patients with symptomatic osteoarthritis: a randomized controlled trial. Arthroscopy 2013;29:1635-43.

Table 1: Demographic details of the patients

	Group A (PRP)	Group B (HA)	p-value*#
Age (yrs) (Mean ± SD)	50.24 ± 6.72	52.28 ± 6.46	0.28
Sex (Male: Female)	15:10	14:11	0.78
Kellgren-Lawrence score (Mean)	2	2.08	0.71

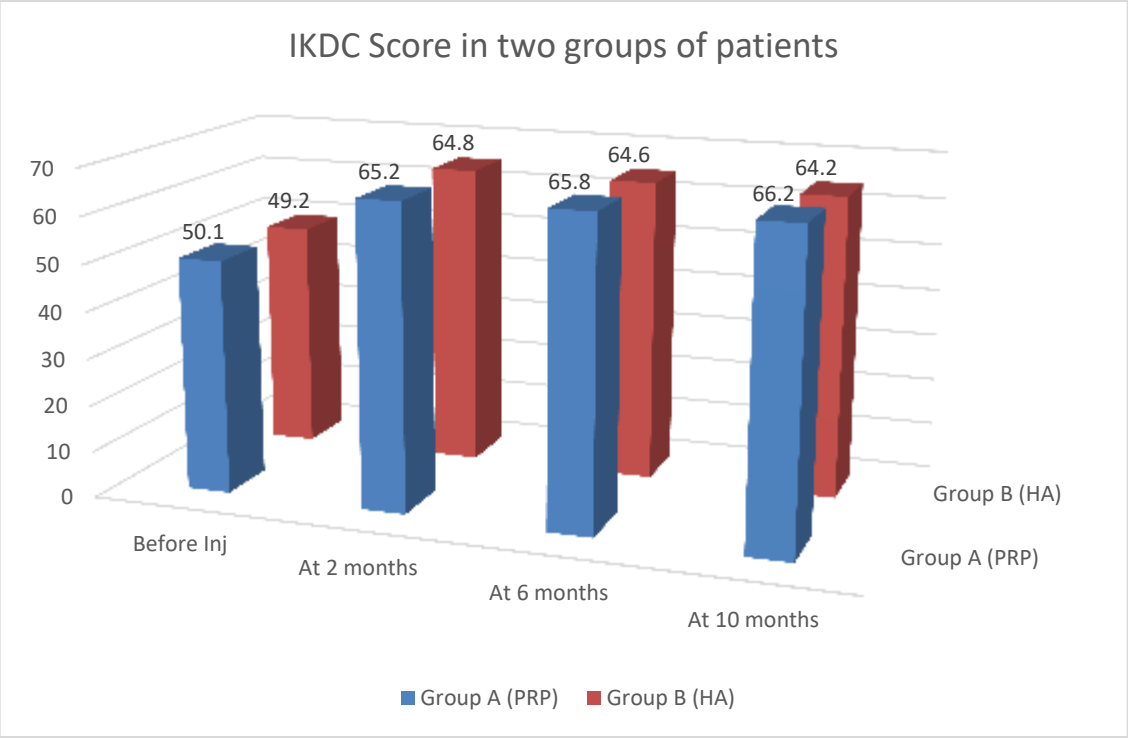
*Student's t-test (unpaired), #p<0.05 was considered significant

Table 2: KOOS scores at start and follow-up in both treatment groups

	Group	Before Inj	2 months	6 months	10 months
Symptoms	Group A	65.2 ± 16.4	72.1 ± 17.2	74 ± 16.6	73.9 ± 17.2
	Group B	65.8 ± 16.0	71.1 ± 16.6	72.1 ± 16.9	73.9 ± 18.4
ADL	Group A	66.3 ± 17.9	74.0 ± 19.5	74.5 ± 19.2	74.8 ± 19.1
	Group B	64.3 ± 17.7	72.6 ± 16.5	74.8 ± 17.1	75.1 ± 19
Pain	Group A	66.5 ± 17.2	72.9 ± 18.1	73.2 ± 17.3	76.1 ± 18.2
	Group B	65.9 ± 15.9	71.7 ± 16.2	73.1 ± 16.2	75.2 ± 19.7
Sport	Group A	38.6 ± 25	48.2 ± 26.8	48.7 ± 28.6	49.9 ± 28.6
	Group B	35.9±24.7	44.3 ± 25.4	45.1 ± 27.7	46.9 ± 28.1
QOL	Group A	36.0±19.4	48.4 ± 23.1	49.2 ± 23.6	50.5 ± 24.1
	Group B	35.8±18.2	47.3 ± 22.1	49.4 ± 23.4	50.9 ± 24.3

KOOS score: Knee injury and osteoarthritis outcome score; ADL: Activities of daily living; QOL: Quality of life

Fig 1. IKDC scores (International Knee Documentation Committee score) at start and follow-up in both treatment groups



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