

Investigation of the Efficiency and Satisfaction Score of Platelet-Rich Plasma versus Hyaluronic Acid for the Treatment of Knee Osteoarthritis

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ABSTRACT

Introduction: With the aging population, prevalence of osteoarthritis is continuously on an increase. The management of chondral disease is challenging because of its inherent low healing potential. The aim of this study was to investigate the efficiency and satisfaction of platelet-rich plasma v/s hyaluronic acid for knee osteoarthritis.

Materials and Methods: The present study included 115 Patients indicated for the treatment of symptomatic cartilage lesions and/or knee osteoarthritis. The first group of 60 patients was treated using intraarticular application of autologous PRP (PRP group) and 55 patients of the control group (HA group) were treated with HA. After complete medical history and examination, Subjects' age, gender, height and weight were recorded and their body mass index (BMI) was calculated. Basic routine investigations were done on outpatient basis.

Results: The mean age of the study patients was 58±3.4 in PRP group and 62±12.1 in HA Group. There were 36 male and 24 female participants in PRP group and in HA group the male female ratio was 29:26. There were no significant differences between the 2 groups across age, sex, BMI, Vas pain score, or McMaster Universities Osteoarthritis Index.

There was a significant difference in the Symptoms duration.
Conclusion: PRP demonstrated a statistically significant improvement over HA. Our findings further suggest that both HA and PRP may be a superior treatment for patients with OA.

Keywords: Osteo-Arthritis, Platelet-Rich Plasma, Hyaluronic Acid.

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INTRODUCTION

Osteo-arthritis has a prevalence of 22–39 % in India, accounting for 30% of all joint disorders. It ranks among the top ten causes of disability worldwide and has a major impact on functioning and independence of a person.¹ With the aging population, prevalence of osteo-arthritis is continuously on an increase. The management of chondral disease is challenging because of its inherent low healing potential. In fact, the regeneration ability of cartilage is limited due to its isolation from systemic regulation and its lack of vessels and nerves.² Intra-articular injection of Human umbilical cord blood as a new source of mesenchymal stem cells was found effective for cartilage repair in rats with osteoarthritis.³

The most common symptoms of knee osteoarthritis are pain and physical limitations that have a significant effect on the individual's quality of life and her or his social and economic activities.^{4,5} Due to the increase in life expectancy, the number of elderly people,

and the prevalence of obesity in society, it seems that the prevalence of knee osteoarthritis will increase. This will be one of the serious problems of health system that imposes great costs to societies. Today, drug therapies, including painkillers, corticosteroids, glucosamine, chondroitin, sulfate, and non-steroid anti-inflammatory drugs are used along with viscosupplementation to relieve pain and symptoms as well as to slow the progression of the arthritis.⁴ In addition, intra-articular injection is used as a good option for drug therapy of arthritis.⁶ Hyaluronic acid (HA) and platelet-rich plasma (PRP) are two treatment options that are used.^{7,8}

An HA injection is expensive and is a synthetically manufactured product.^{9,10} In addition, HA has not been shown to reliably address the intra-articular inflammatory cascade and can cause acute reactions in some patients.^{9,11,12} The use of autologous blood

products, such as PRP, provides an opportunity to improve patient outcomes using an autologous biological alternative to HA while also addressing the underlying inflammation through the stimulation of growth factors and the suppression of inflammatory cytokines. The injections of platelet-rich plasma (PRP) and HA have been extensively applied to regulate the complex spatiotemporal signaling within and between the joint tissues and to improve lubrication and modulate inflammation, which can restore a natural healing micro-environment.^{13,14} Several studies¹⁵⁻¹⁹ have shown superior results of intra-articular PRP injections than HA. A meta-analysis has also showed that PRP injection is more efficacious than HA injection and placebo in reducing symptoms and improving function and quality of life.²⁰ However, the exact efficacy of the combination of the two therapeutic agents -PRP and HA, remains unclear. The aim of this study was to investigate the efficiency of platelet-rich plasma versus hyaluronic acid for the treatment of knee osteoarthritis.

MATERIALS AND METHODS

The present study included 115 Patients indicated for the treatment of symptomatic cartilage lesions and/or knee osteoarthritis. This study was conducted in Department of Orthopaedics, G S Medical College and Hospital, Pilkhuwa, Uttar Pradesh. The study protocol was approved by the institutional ethical committee. Written informed consent was taken from the patients or guardians of patients before taking part in this study. Patients were randomly divided into two groups. The first group of 60 patients was treated using intraarticular application of autologous PRP (PRP group) and 55 patients of the control group (HA group) were treated with HA. The exclusion criteria were bilateral symptomatic knee OA; age older than 70 years; intra-articular steroid, hyaluronic acid or PRP injections in the last 6 months; active infection, inflammation or tumor existence around the knee; history of diabetes mellitus, coagulopathies, malignant, immunosuppressive, collagen vascular or autoimmune disorders; genu varum or valgus greater than 5 degrees. After complete medical history and examination, Subjects' age, gender, height

and weight were recorded and their body mass index (BMI) was calculated. Basic routine investigations were done on outpatient basis. The following diagnostic criteria for patient selection were used: patients affected by a monolateral lesion with a history of chronic (for at least 4 months) pain or swelling of the knee and imaging findings of degenerative changes of the joint (Kellgren Lawrence 0 to III at X-ray evaluation or MRI findings of degenerative changes in patients presenting with no OA X-ray findings). Exclusion criteria were: age > 80 years; Kellgren-Lawrence score > 3; systemic disorders such as diabetes, rheumatoid arthritis, major axial deviation (varus >5°, valgus > 5°), haematological diseases (coagulopathy), severe cardiovascular diseases, infections, immunodepression, patients in therapy with anticoagulants or antiaggregants, use of NSAIDs in the 5 days before blood donation and patients with Hb values < 11 g/dl and platelet values < 150,000/mm³.

Statistical Package for the Social Sciences (SPSS) software version 21.0 (SPSS Inc., Chicago, USA). All continuous data were reported as mean ± standard deviation (SD). Dichotomous data are expressed as frequencies and percentage. For all tests, $P < 0.05$ was considered significant.

RESULTS

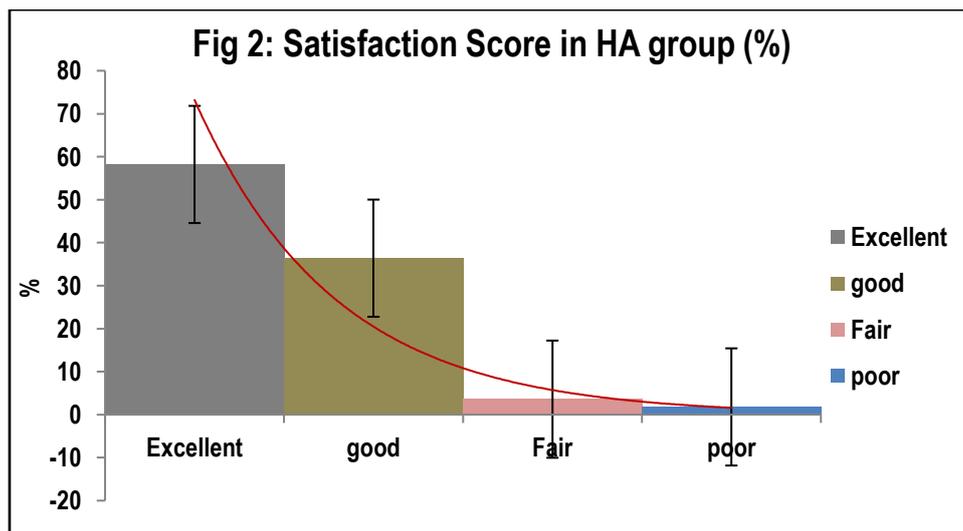
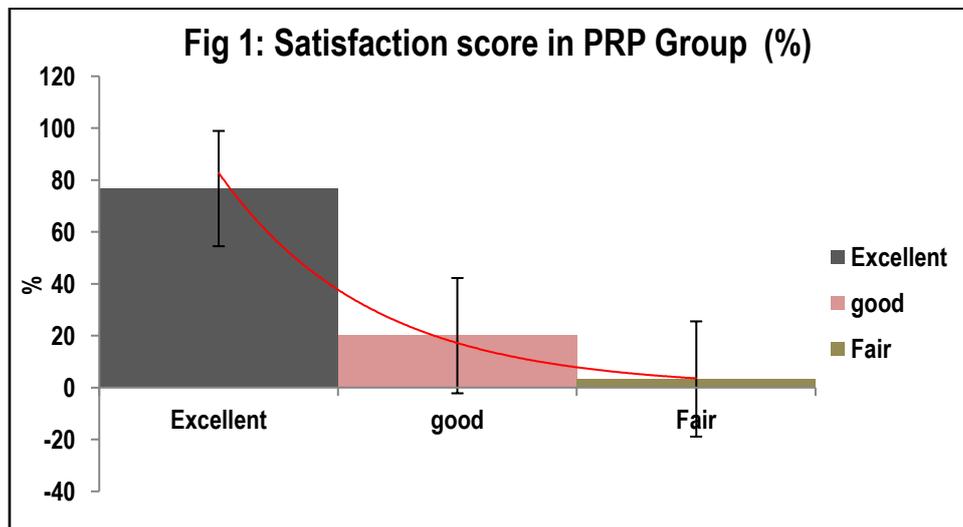
In the present study patients were randomly divided into two groups. The first group of 60 patients was treated using intraarticular application of autologous PRP (PRP group) and 55 patients of the control group (HA group) were treated with HA. The mean age of the study patients was 58±3.4 in PRP group and 62±12.1 in HA Group. There were 36 male and 24 female participants in PRP group and in HA group the male female ratio was 29:26. The total time needed to prepare the platelet concentrate was approximately 60 mins. Complete blood count analysis was performed on whole blood and platelet-rich plasma samples from each study participant. The number of platelets in PRP increased with respect to the number of platelets in the whole blood sample. The mean platelet density increased by 450% in average when compared with the whole blood.

Table 1: Demographic and clinical data of enrolled patients

Data	PRP Group (n = 60)	HA Group(n = 55)	P Value
Age, y, mean ± SD	58±3.4	62±12.1	0.643
M/F ratio	36:24	29:26	-
BMI	25.7±3.8	26.2 ± 4.9	0.431
Symptoms duration (months)	18.9 ± 2.3	15.11 ± 6.7	0.05
Knee side (R:L)	32:28	28:27	-
Kellgren-Lawrence classification			
Grade 1	7	3	-
Grade 2	29	28	
Grade 3	24	25	
VAS pain score (0-100), mean	52.6	59.7	0.29
McMaster Universities Osteoarthritis Index	36±11.34	39±14.6	0.201

Table 2: Satisfaction Score

Satisfaction	PRP Group (%)	HA group (%)
Excellent	46 (76.7%)	32 (58.2 %)
good	12 (20 %)	20 (36.4 %)
Fair	2 (3.3 %)	2 (3.6 %)
poor	-	1 (1.8 %)



There were no significant differences between the 2 groups across age, sex, BMI, Vas pain score, or McMaster Universities Osteoarthritis Index. There was a significant difference in the Symptoms duration. This difference was not deemed clinically meaningful, as the BMI of patients in the HA group (26.2 ± 4.9 kg/m²) and PRP group (25.7 ± 3.8 kg/m²) fell within the “overweight” classification based on the weight assessment of the CDC. For all outcome scores, there was a significant interaction between pretreatment and post-treatment results up to the 24-week follow-up ($P < .05$). In the PRP group, we found improvement in the mean score of the Western Ontario and McMaster Universities Osteoarthritis Index was 36 ± 11.34 and in HA group was 39 ± 14.6 . Satisfaction score between two groups were seen in table 2 (Figure 1 and 2).

DISCUSSION

In the present study there were no significant differences between the 2 groups across age, sex, BMI, Vas pain score, or McMaster Universities Osteoarthritis Index. There was a significant difference in the Symptoms duration. This difference was not deemed clinically meaningful, as the BMI of patients in the HA group (26.2 ± 4.9 kg/m²) and PRP group (25.7 ± 3.8 kg/m²) fell within the “overweight” classification based on the weight assessment of the CDC. For all outcome scores, there was a significant interaction between pretreatment and post treatment

results up to the 26-week follow-up ($P < .05$). In the PRP group, we found improvement in the mean score of the Western Ontario and McMaster Universities Osteoarthritis Index was 36 ± 11.34 and in HA group was 39 ± 14.6 .

Our clinical results corroborate those in the recent literature^{10,15,16,21} in that treatment demonstrates a statistically significant improvement in pain and function from the pretreatment time point with both HA and PRP. Despite the failure of our primary clinical outcome measure, the WOMAC pain score, to show statistical significance, our secondary outcome measures demonstrated not only a statistical but also a clinically meaningful difference in the IKDC score between the PRP and HA groups at 24 and 52 weeks. According to Greco et al,²² a patient must have, at minimum, an absolute change of 6.3 at 24 weeks and 16.7 at 52 weeks on the IKDC score to achieve clinical significance. Treatment with PRP restores the natural rheologic and metabolic homeostasis of the joints affected by the arthrotic process. The biochemical modifications induced by PRP treatment improve the protective, lubricating, and shock-absorbing effect of the synovial fluid. This therapeutic approach does not cause side effects such as inflammatory and pseudoseptic reactions, a great advantage. The study by Sanchez et al.²³ presented the preliminary results of the effectiveness of intra-articular injections of PRP in retrospective cohort study of 30 patients treated with PRP and 30 patients treated with HA. Few studies have evaluated the

effectiveness of PRP plus HA in KOA. To our knowledge only one recent clinical trial²⁴ compared the effectiveness of PRP and HA. This trial showed that the association of PRP plus HA is effective and safe in the treatment for patients suffering from mild-to-moderate KOA. The completion of the entire planned 115 patient evaluation will confirm whether this trend will reach a statistical and clinical significance, thus demonstrating a clear indication for this biological treatment approach, as well as the potential of the double spinning high concentrate leukocyte PRP with respect to the single spinning low concentrate leukocyte free PRP that recently showed better results with respect to HA.¹⁷

CONCLUSION

PRP demonstrated a statistically significant improvement over HA. Our findings further suggest that both HA and PRP may be a superior treatment for patients with OA and a low BMI. This finding suggests that the anti-inflammatory properties of PRP may contribute to an improvement in OA symptoms.

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