A COMPARATIVE STUDY OF INTRAARTICULAR PRP AND HYALURONIC ACID FOR OSTEOARTHRITIS KNEE JOINT

Orthopaedics

Dr. Arnab Kumar Saha	Department of Orthopaedics, CMRI, Kolkata
Dr. Supantha Panja	Department of Orthopaedics, CMRI, Kolkata
Dr. Rakesh Sarkar	Department of Orthopaedics, CMRI, Kolkata
Dr. Saptadeep Das*	DNB ORTHO PGT, Government District General Hospital, Eluru, West Godavari, Andhra Pradesh *Corresponding Author

ABSTRACT

Intrarticular injections with PRP and HA can be quite beneficial to treat OA knee patients that cannot be managed by analgesics and physiotherapy alone. However, there is no consensus regarding the better efficiency of PRP vs HA till now. Hence, this study compares the efficiency of these procedures in terms of clinical outcomes as measured by functional and pain assessment. This hospital based prospective randomised trial was conducted among 100 patients (50 study group and 50 in control group), selected using simple randomisation sampling. The functional assessment after both procedures was evaluated at 6 weeks, 3 months, 6 months and 1 year using the WOMAC scale and VAS scale. The p-value using unpaired t-test in comparison between the two groups not statistically significant through all the follow up periods showing that PRP was not superior to HA even though both the groups showed significant improvement in the WOMAC scores at all follow up points (p=0.215 ;6 weeks, p=0.961; 3 months,p=0.738;6 months) .Group I VAS shows a reduction in mean of 7.3 to 3.1 which denotes improvement in the patient's pain There was a significant reduction of VAS mean from 7.04 to 3.04 in Group II, showing significant improvement in pain.The p value was not statistically significant when comparing the 2 groups (p=0.807) Our studies conclude that both modalities were efficient in improving the functional status of the knee and reduce symptoms of OA, PRP did not provide superior clinical improvement compared with HA in symptomatic or functional improvement at different follow-up stages.

KEYWORDS

: Comparative study, Hyaluronic acid, Intra-articular injections, Knee Osteoarthritis, Platelet-rich plasma

INTRODUCTION

Platelet-rich plasma (PRP), which are nothing but autologous growth factors, and hyaluronic acid (HA) are used for minimally invasive treatments for osteoarthritis (OA) of the knee. Knee osteoarthritis (OA) is a degenerative disease and leading cause of disability and economic burden with various clinical manifestations, such as joint pain, tenderness, swelling , stiffness, deformities.(1) Out of all people aged 60–75 years more than 50% show radiological evidence of knee OA and 80% of population over 75 years old suffer from OA knee**.** Owing to multifactorial causes the incidence of this condition has increased worldwide.(2)

Analgesics, physiotherapy, and lifestyle modification are the main stay of treatment for early OA. Analgesics reduce inflammation and pain but do not delay disease progression.(3) Visco- supplementation with hyaluronic acid (HA) is now a well-known treatment modality in knee Osteoarthritis (OA).(4) HA is an essential component of the extracellular matrix .It is anionic, non-sulfated glycosaminoglycan and serves as a physiologic lubricant for synovial joints and a mediator of anti-inflammatory and regeneratory activities.(5) There are numerous HA formulations now available. Intrarticular injection of HA has been recommended in the management of patients with OA knee by the American College of Rheumatology (ACR) (6)

PRP is an autologous derivative from patients' own blood through centrifugation. It has various growth factors which regulate the inflammatory process, regeneration of tissue structures and thus promote tissue healing.(7) The many growth factors in PRP are platelet-derived growth factor, transforming growth factor-beta (TGF-β), insulin-like growth factor-1 (IGF-1), vascular endothelial growth factor, epidermal growth factor, and fibroblast growth factor (5-7).(8) A study conducted by Lin et al.in 2018 showed that intraarticular injections of leukocyte-poor PRP provide clinically significant functional improvement for at least 1 year in patients with mild-to-moderate knee osteoarthritis.(9) Treatment of knee OA using both these modalities is still controversial.

No consensus has been reached regarding the better efficiency of HA vs PRP injection till now. Additionally, there is a paucity of studies in Indian context comparing the clinical value of HA and PRP injections for treatment of OA knee. This study was an attempt to compare theefficiency of these modalities in terms of clinical outcomes as measured by WOMAC and VAS scores.

Methodology
Study design & settings

This hospital based prospective randomised trial was conducted among 100 patients, selected using simple randomisation sampling, who were treated for OA knee at a tertiary care hospital from January 2022 to April 2022. Among the study participants 50 received HA injection (control group) and 50 received PRP injection (study group). The study was approved by the ethics committee of the hospital. Informed consent was obtained from all patients before the initiation of study.

Inclusion criteria

Inclusion criteria included: (i) age between 45 and 75 years and (ii) grade 2 (mild) or 3 (moderate) knee OA according to Kellgren and Lawrence grading scale (iii) patients with stable vital signs and without any organ dysfunction, including heart, liver, or kidney dysfunction (i.e. patients who could tolerate the procedure.

Exclusion criteria

Exclusion criteria included (i) Immunosuppressed patients (ii) secondary osteoarthritis, (iii) connective tissue disorders, (iv) inflammatory arthritis, (v) who got steroid injections in last 6 months, (vi) Patients with coexisting backache.
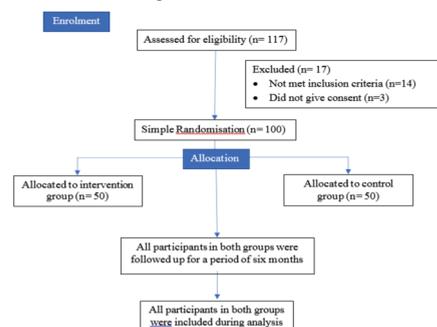

Fig 1: Consort flow diagram for selection of study participants

Treatment methods

In both the groups, patients were treated either PRP or HA. The skin was prepared and draped with strict aseptic precautions. Intra-articular injection of 2 ml autologous PRP or 2 ml HA preparation was administered in the affected knee. To disseminate the fluid uniformly in the joint,the joint was passively mobilized.In PRP (study group), About 300 ml of venous blood was drawn from the patients.

The collected blood was centrifuged in a refrigerated centrifuge and Platelet Rich Plasma was separated after removing red blood cells and buffy coat. The whole process of separating Platelet Rich Plasma was standardized and done under strict aseptic precautions. The process yielded packed cells and fresh frozen plasma which was transfused back to the patient. The Patients baseline platelet count and leucocyte count were determined and Platelet Rich Plasma was quantified as having eight to ten times the baseline value of platelets. In HA (control group) 2 ml HA preparation was administered in the affected knee.

Outcome measures

The functional assessment after both procedures was evaluated at 6 weeks, 3 months, 6 months using the WOMAC scale and the patients were also assessed for reduction in pain using Visual analog scale both at pre injection and at 6 months post injection

WOMAC scale:

The Western Ontario and McMaster Universities Arthritis Index (WOMAC) Index was developed in 1982 at Western Ontario and McMaster Universities and can be used to evaluate the efficacy of therapy aimed at OA knee and monitor disease progression. The WOMAC (Western Ontario and McMaster Universities) uses twenty four parameters

Scale of difficulty is taken as below for the 24 heads. Total score being maximum of 96. Zero to 4 with zero being none and 4 being extremely

Visual Analog Scale For Pain:

The visual analog scale (VAS) is a tool widely used to measure pain. A patient is asked to indicate his/her perceived pain intensity (most commonly) along a 100 mm horizontal line, and this rating is then measured from the left edge (=VAS score).on a scale from 0 (no pain) to 10 (worst possible excruciating pain)

Kellgren and Lawrence system for classification of osteoarthritis

- grade 0 (none): definite absence of x-ray changes of osteoarthritis
- grade 1 (doubtful): doubtful joint space narrowing and possible osteophytic lipping
- grade 2 (minimal): definite osteophytes and possible joint space narrowing
- grade 3 (moderate): moderate multiple osteophytes, definite narrowing of joint space and some sclerosis and possible deformity of bone ends
- grade 4 (severe): large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone ends

Statistical analysis

Data analysis was done using the SPSS, Statistical Package for the Social Sciences (version 22.0; SPSS Inc, Chicago, Illinois).. The categorical demographic and clinical variables in study and control group were presented as frequency and percentages. The inter-group differences between the study and control group was determined using chi-square test for categorical variables and t-test for continuous variable (scores). P value less than 0.05 was accepted as the level of statistical significance.

RESULTS

The characteristics of participants in study and control group have been described in Table 1,2 &3. No intergroup differences were found in gender, age (all P > 0.05).

Age distribution shows mean age in group I as 51.06 and the mean age in Group II as 51.04. The p-value using t-test is 0.987.Age and gender distributions were comparable in both the groups with 80 % male 20% female. The p-value by chi square test is 0.799 .

WOMAC index for Group I (PRP) (Table:4)had a mean of 74.28 before the injection, decreased at 6 weeks to 62.58 and at 3 months to 47.8 and at 6 months to 33.56 . This shows a significant reduction in

WOMAC score in the study group, which was also steady throughout the study period.

WOMAC index for Group II (HA) (Table:4) had a mean of 74.04 before the injection , decreased at 6 weeks to 64.10 and at 3 months 47.88 and at 6 months to 34.08. This shows a significant reduction in WOMAC score in the control group, which was also steady throughout the study period. The p-value using unpaired t-test in comparison between the two groups were not statistically significant through all the follow up periods (p=0.215 ;6 weeks, p=0.961; 3 months,p=0.738;6 months)

Group I had a reduction in VAS mean of 7.3 to 3.1. (Table:5) There was a reduction from 7.04 to 3.04 on mean in Group II .The p value was not statistically significant when comparing the 2 groups (p=0.807)

Table 1: Demographic characteristics of study participants - Age

Age Distribution	Platelet Rich Plasma	%	HA	%
45-50 years	23	48.9	25	53.2
51-60 years	19	40.4	17	36.2
> 61 years	5	10.6	5	10.6
Total	50	100	50	100

Table 2: Comparability of age distribution in both groups

Age	PRP	HA
N	50	50
Mean	51.06	51.04
SD	6.27	6.34
P value t Test .987		

Table 3: Demographic characteristics of study participants - Gender

Gender	HA	%	PRP	%
Male	41	82.00	40	80.00
Female	9	18.00	10	20.00
P value 0.799				

Table 4: Comparison of functional assessment using WOMAC Scale between PRP and HA groups

WOMAC Score		Pre-injection	Follow- up after 6 weeks	Follow- up after 3 months	Follow- up after 6 months
PRP	N	50	50	50	50
	Mean	74.28	62.58	47.8	33.56
	SD	4.99	6.62	8.19	7.66
HA	N	50	50	50	50
	Mean	74.04	64.10	47.88	34.08
	SD	4.80	5.50	8.10	7.82
P value		.807	.215	.961	.738

Table 5: Comparison of VAS scale Pain assessment between PRP and HA groups

Visual Analog Score		Pre-injection	Post-injection
PRP	N	50	50
	Mean	7.3	3.1
	SD	0.95	1.23
HA	N	50	50
	Mean	7.04	3.04
	SD	1.00	1.21
P value Unpaired t Test		0.188	0.807

DISCUSSION

Our study compares the efficacy of PRP and HA in terms of clinical outcomes as measured by WOMAC scale and VAS scale.

PRP and HA, both the treatments were found to be safe and had no adverse effects or complications throughout the study period.

The p-value using unpaired t-test in comparison between the two groups not statistically significant through all the follow up periods showing that PRP was not superior to HA even though both the groups showed significant improvement in the WOMAC scores at all follow up points (p=0.215 ;6 weeks, p=0.961; 3 months,p=0.738;6 months) Group I VAS shows a reduction in mean of 7.3 to 3.1 which denotes improvement in the patient's pain

There was a significant reduction of VAS mean from 7.04 to 3.04 in Group II, showing significant improvement in pain.The p value was not statistically significant when comparing the 2 groups (p=0.807)

Recent studies compared HA and PRP to evaluate which modality is better. In 2016, a meta- analysis reported that PRP was more effective when compared with HA.(10) Cole et al. noted no difference between HA and PRP in Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pain score.(11) An open label trial in 2021 found out that both modalities reduce the severity of pain and improve function in patients with OA, but PRP gave better and longer lasting improvement compared to HA (12) A metanalysis in 2020 concluded that HA combined with PRP gave the best results in functional improvement in OA knee.(1)

Sun et al. noted that combined injections of HA and PRP achieved better VAS pain reduction than a single PRP at 6 months. (13) Tang et al. concluded in their meta-analysis that Intra- articular PRP injection was more efficacious than HA injection for the treatment of Knee OA. (14)Our study concluded that better function was achieved in both groups after treatment as evaluated by WOMAC scale and VAS but the PRP group was not superior to the HA group since p value was not statistically significant (P value>0.05).

CONCLUSION
Our studies conclude that both modalities were efficient in improving the functional status of the knee and reduce symptoms of OA; PRP did not provide superior clinical improvement compared with HA in symptomatic or functional improvement at different follow-up stages.

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