

## ORIGINAL RESEARCH

### Comparative study of intra-articular hyaluronic acid (HA) injection versus platelet rich plasma (PRP) in early knee osteoarthritis

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#### ABSTRACT

**Aim:** The purpose of the present research was to explore this biologic approach to treat OA, analysing and comparing results of hyaluronic acid (HA) versus platelet-rich plasma (PRP).

**Methodology:** A prospective study with randomised selection of 47 ( 80 knees) patients for the assessment of outcome of treatment of early Osteoarthrosis of knee with intra-articular infiltration of platelet rich plasma (PRP) versus hyaluronic acid (HA) was carried out in the department of orthopaedics at Jawaharlal Nehru Medical College & Acharya Vinoba Bhave Rural Hospital, Sawangi (M), Wardha from July 2012 to April 2014. The patients were grouped into two categories- where 40 knees were injected with intra-articular HA injections and rest was injected with PRP injections. The mean was compared using paired t- test or independent t- test depending on the distribution of samples. The proportions were analysed using Binominal and Chi Square Test.

**Results:** At 3 months there was significant reduction in VAS and WOMAC scores in both the groups as compared to baseline. At 6 months, the subjects treated with PRP showed a continuous improvement, whereas the subjects treated with HA showed a sharp worsening for both the scores. Although the mean VAS score was 3.50 in the PRP group (SD= 0.847), it was 4.73 in the HA group (SD= 1.219) whereas mean WOMAC score was 37.25 in the PRP group (SD= 5.54), it was 61.98 in the HA group (SD= 4.85).

**Conclusion:** Treatment with PRP show significantly better outcome compared with HA treatment.

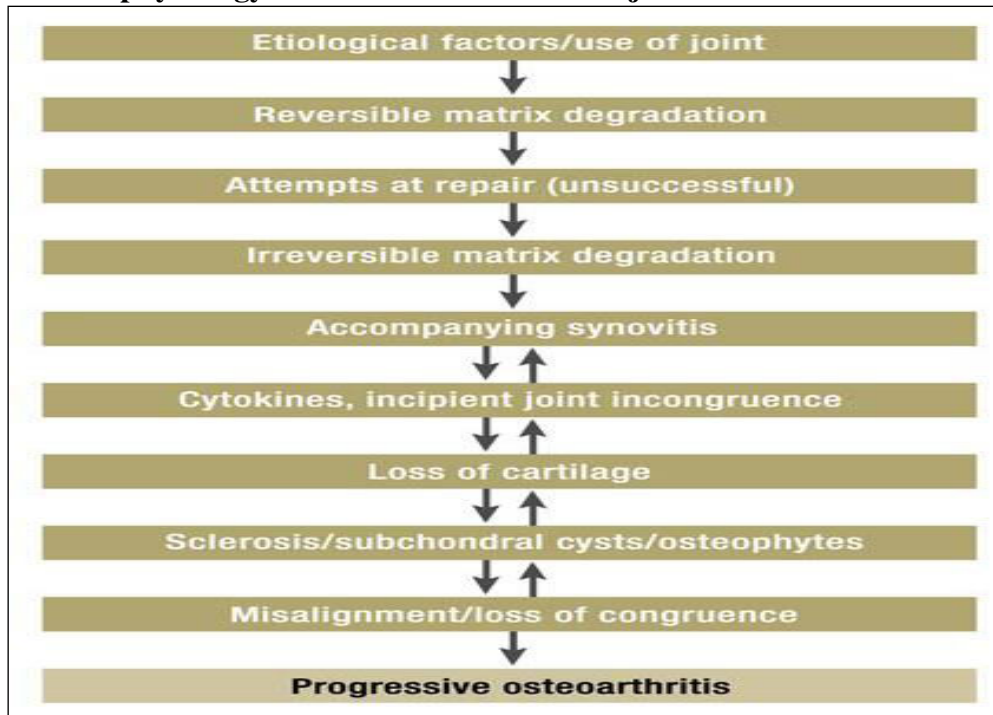
**Keywords:**Osteoarthritis, Platelet rich plasma, Hyaluronic acid, Degeneration of joints.

#### INTRODUCTION

Osteoarthritis (OA) knee is a degenerative disorder of multifactorial etiology characterized by loss of articular cartilage, hypertrophy of bone at the margins, subchondral sclerosis and range of biochemical and morphological alterations of the synovial membrane and joint capsule. It can present as localized, generalized or as erosive osteoarthritis. Clinical OA is defined by features in the history and on examination. It invariably requires the presence of joint pain in addition to other features.<sup>1</sup>The regeneration capacity of cartilage is limited

because of its isolation from systemic regulation and its lack of vessels and nerve supply. OA has a major impact on functioning and independence and ranks among the top ten causes of disability worldwide. Knee OA is more common in women, with female-to-male ratios varying between 1.5:1 and 4:1.<sup>2</sup> A variety of non-invasive solutions have been proposed for pain treatment, improvement in function and disability, and ultimately, modification of the course of OA with variable success rate. In normal cartilage, a delicate balance exists between matrix synthesis and degradation; in OA, however, cartilage degradation exceeds synthesis. The balance between synthesis and degradation is affected by age and is regulated by several factors produced by the synovium and chondrocytes, including cytokines, growth factors, aggrecanases, and MMPs.<sup>3</sup>(Figure 1)

**Figure 1: Pathophysiology of osteoarthritis in a knee joint**



Intra-articular injection of corticosteroid, as indicated by a few studies are only for short term benefit for pain and function and further more they are not able to change the natural history of the disease and may also have negative consequences. Among the available pharmacological solution, despite the contradictory finding and controversies regarding its effective usefulness intra-articular hyaluronic acid (HA) is widely applied in clinical practice, with good results reported in many studies. Hyaluronic acid works by acting as a cushion and lubricant in the joints and other tissues. Autologous platelet rich plasma (PRP) injections were first used in 1987 in open heart surgery. Today, PRP injections have been safely used in many fields including sports medicine, orthopaedics, cosmetics, fasciomaxillary and urology. During the healing process, the platelets are activated and aggregate together.<sup>4,5</sup> They contain growth factors which stimulate the inflammatory cascade and healing process. Injection of PRP and /or HA may provide benefit for patients suffering from osteoarthritis of knees, preventing and delaying the need of a larger operative measures.

#### **AIM OF THE PRESENT STUDY**

The purpose of the present research was to analyse the role of biological products such as autologous platelet rich plasma and hyaluronic acid in early osteoarthritis of knee by evaluation clinical and functional outcomes using VAS and WOMAC index.

## METHODOLOGY

A prospective study with randomised selection of 47 ( 80 knees) patients for the assessment of outcome of treatment of early Osteoarthritis of knee with intra-articular infiltration of platelet rich plasma (PRP) versus hyaluronic acid (HA) was carried out in the department of orthopaedics at Jawaharlal Nehru Medical College & Acharya Vinoba Bhave Rural Hospital, Sawangi (M), Wardha from July 2012 to April 2014 after taking their written informed consent. All patients were below 90 years of age and had either grade I or Grade II osteoarthritis based on Kellgren-Lawrence grading system radiologically. The patients were grouped into two categories- where 40 knees were injected with intra-articular HA injections and rest was injected with PRP injections. They were followed up for 3-6 months. The mean volume PRP injected in this study was 5.5 ml and 20mg/2ml of HA for each infiltration.

## PATIENTS WERE EXAMINED CLINICALLY AND FUNCTIONALLY

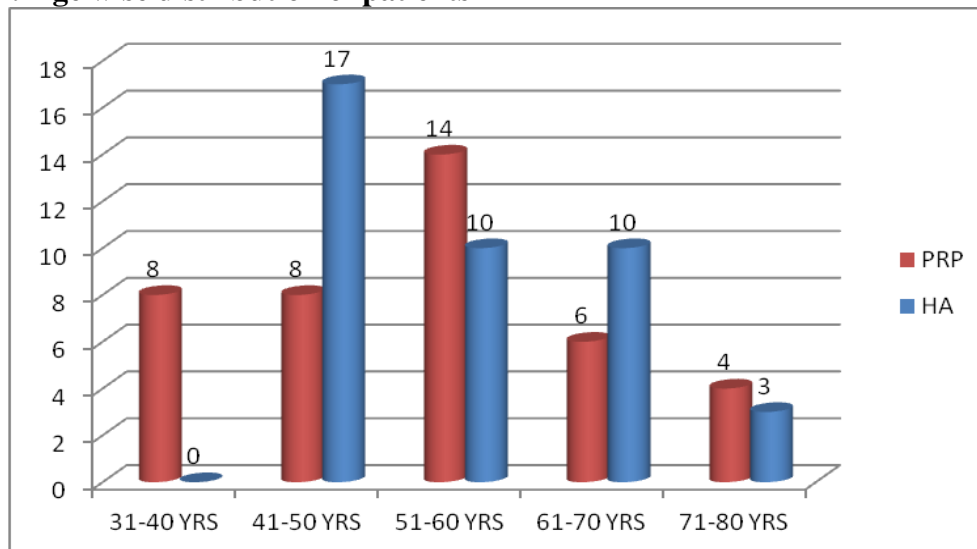
- Radiological evaluation (baseline): Kellgren and Lawrence grading system. This was carried on standard Antero- Posterior and Lateral views.
- Clinical evaluation: Clinical Evaluation was done according to VAS scoring
- Functional evaluation: The WOMAC (Western Ontario and McMaster Universities) Index of Osteoarthritis.

Statistical analysis was done using IBM SPSS Version 17 software on windows 7. Variables were categorized in scale, nominal and ordinal. The mean were compared using paired t- test or independent t- test depending on the distribution of samples. The proportions were analysed using Binominal and Chi Square Test. Correlation of proportions were established using Pearson Correlation formula.

## RESULTS

47 patients were included in this study of which 80 knees were included. Number of patients with bilateral knees was 28 and unilateral knee was 24. Gender wise distribution of knees showed 22 males and 18 females in PRP group and 11 males and 29 females in HA group, showing male predominance in PRP group and female predominance in HA group. As far as age distribution was considered, the mean age in PRP group was 54 years, youngest patient being 32years and oldest 80years. The mean age in HA group was 56 years, youngest patient being 42years and oldest 72years. The mean age for this study was 55.25 with  $SD \pm 11.36$ , ranging from 32 to 80 years. (Graph 1)

**Graph 1: Age wise distribution of patients**



Grade wise distribution of knees showed 18 grade I and 22 grade II in PRP group and 21 grade I and 19 grades II in HA group. At 3 months there was significant reduction in VAS and WOMAC scores in both the groups as compared to baseline. At 6 months, the subjects treated with PRP showed a continuous improvement, whereas the subjects treated with HA showed a sharp worsening for both the scores. Although the mean VAS score was 3.50 in the PRP group (SD= 0.847), it was 4.73 in the HA group (SD= 1.219) (Table 1)

**Table 1: Comparisons of mean VAS score at baseline and 3 months and baseline and 6 months in PRP and HA group**

Descriptive Statistics		Mean	N	SD	Std. Error Mean
PRP	VAS score baseline	7.35	40	1.027	.162
	3 months	4.95	40	1.085	.172
PRP	VAS score baseline	7.35	40	1.027	.162
	6 months	3.50	40	.847	.134
HA	VAS score baseline	6.19	22	.957	.204
	3 months	3.14	22	.888	.189
HA	VAS score baseline	6.19	22	.957	.204
	6 months	4.05	22	.950	.203

Whereas mean WOMAC score was 37.25 in the PRP group (SD= 5.54), it was 61.98 in the HA group (SD= 4.85). (Table 2) The difference recorded between the groups was statistically significant (P=0.00).

**Table 2: Comparisons of mean WOMAC score at baseline and 3 months and baseline and 6 months in PRP and HA group**

Descriptive Statistics		Mean	N	SD	Std. Error Mean
PRP	WOMAC score -baseline	75.33	40	3.511	.555
	3 month	47.20	40	5.120	.810
PRP	WOMAC score -baseline	75.33	40	3.511	.555
	6 month	37.25	40	5.541	.876
HA	WOMAC score -baseline	70.29	22	4.589	.978
	3 month	51.48	22	4.532	.966
HA	WOMAC score -baseline	70.29	22	4.589	.978
	6 month	59.29	22	3.869	.825

## DISCUSSION

Articular cartilage lesions and degeneration are difficult to treat and present a challenge for orthopaedic surgeons because of the distinctive structure and function of hyaline cartilage and its inherent low healing potential. Osteoarthritic joints have a lower-than-normal concentration of HA, so viscosupplementation delivers a preparation of HA within the joint

with the goal of restoring a more normal joint fluid viscosity and improving the viscoelastic properties for proper joint mechanics. Numerous types of HA are available, these differ from each other in terms of production method, either extraction or fermentation, and their molecular weight. Studies in animal model, rabbit model, and in goat model using HA which showed that HA injection has beneficial effects on knee degeneration, some studies showed that it lacks efficacy.<sup>6</sup> Gaissmaier et al investigated the effect of human platelet supernatant on chondrocytes in human articular biopsy specimens and observed an acceleration of chondrocyte expansion<sup>7</sup>, whereas Mishra et al. described how PRP enhanced mesenchymal stem cell proliferation and chondrogenic differentiation in vitro.<sup>8</sup> However, the evidence base for use of PRP is still in its infancy, and there are only few articles that specifically address treatment applications in the orthopaedic field.<sup>9-11</sup> In our study in both groups of patients showed statistically significant improvement at 3 months follow-up (using VAS and WOMAC score). However, at 6 months follow-up PRP group showed further improved results, whereas further worsening was observed in LW HA group. The limitations of our study are lack of placebo control group. The primary outcome scale (appropriate for the evaluation of cartilage lesions but probably less sensitive for OA and for the older group), the evaluation of patients treated in different centres, the low number of patients treated, and the evaluation of the results only at short-term follow-up.

## CONCLUSION

Treatment with PRP show significantly better outcome compared with HA treatment; patients achieved lower WOMAC and VAS scores which were subsequently maintained in PRP. Despite the relatively low number of patients in the sub-group, statistical analysis confirms better results of PRP than HA.

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