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COMPARATIVE ANALYSIS OF THE EFFECTIVENESS OF INTRA-ARTICULAR INJECTION OF PLATELET RICH PLASMA VS HYALURONIC ACID FOR KNEE OSTEOARTHRITIS

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ABSTRACT:

Introduction: Minimally invasive treatments for knee osteoarthritis include platelet-rich plasma (PRP), an autologous source of growth factors, and hyaluronic acid (HA). The purpose of this study was to compare the efficacy of intra-articular PRP injection with HA on knee OA.

Materials and methods: This Randomized prospective clinical study was conducted at Tara Super Speciality clinic**,** Hyderabad, Telangana for 1 year. The study included 80 patients of either gender, aged 40 to 80 years, with grade I-III knee OA who met the inclusion and exclusion criteria. Patients were followed for 6, 12 and 24 weeks. VAS and WOMAC were assessed prior to the injection and at 6 weeks, 12 weeks, and 24 weeks of follow-up visits for all patients.

Results: The mean age of patients in group PRP was 50.64±6.93 and in group HA was 52.42± 6.45. The mean pre-procedural WOMAC and VAS scores of group PRP were 73.45±4.65 and 7.22±0.97 respectively and group HA were 71.32±4.73 and 6.86±0.81. At the end of 12th month, the mean WOMAC and VAS score improved to 32.78±7.84 and 3.12±0.86 in group PRP and 52.32±4.86 and 3.64±0.96 in group HA respectively which was significant statistically.

Conclusion: The current study found that in OA knee patients, the intra-articular PRP group outperformed the HA group in terms of functional result and pain component reduction.

Keywords: Knee osteoarthritis, Platelet Rich Plasma, Hyaluronic Acid,

Introduction:

Knee osteoarthritis is widespread among older persons worldwide, with an ageing & increase in the obese population [1]. It is also the second greatest cause of disability, imposing a significant economic and societal burden [2]. The present therapeutic options for this chronic illness, which has no definite cure, have been focused on pain relief, symptom reduction, and slowing articular degradation (3, 4).

PRP is an enriched extract of platelets derived from autologous peripheral blood, containing high concentrations of multiple regenerative factors including 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). Aside from these benefits, PRP therapy has been demonstrated to be useful in soft-tissue and wound healing, as well as in promoting regeneration in articular and orthopedic problems (8-10).

Compared to current surgical approaches for OA, such as arthroplasty, lavage, debridement, subchondral stimulation, and tissue grafting (11, 12), intra-articular PRP injections can be classified as minimally invasive modalities though their efficacy is still being studied. HA is an anionic, non-

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sulfated glycosaminoglycan that is an essential component of the extracellular matrix, particularly connective tissue. It is also a physiologic lubricant for synovial joints, as well as a promoter of cell migration and proliferation, anti-inflammatory properties, and tissue regeneration (13, 14). Given these distinct qualities, various businesses have created platforms to extract HA from natural sources and produce HA-based medicines for the treatment of degenerative articular disorders. The FDA approved the intra-articular injection of HA for knee OA after clinical trials showed good outcomes in terms of lowering knee pain and increasing daily activity. Although HA-based products were initially promoted as potential structure-modifying agents, they were later discovered to be primarily symptom-modifying, as they typically produce transient viscosity supplementation with no significant long-term benefit for diseased cartilage (15, 16).
The present study was conducted to know efficacy of intraarticular injection of platelet-rich plasma compared to hyaluronic acid for the treatment of patients with osteoarthritis of the knee.

Materials and Methods:
This Prospective double blind Randomized controlled study was conducted on 80 patients aged 40-to 80-years-old with knee osteoarthritis for 12 months in the department of Orthopaedics, Tara Super Speciality clinic, Nallagandla, Hyderabad, Telangana if they matched the following criteria after taking clearance from Institutional ethics committee.

Inclusion criteria:
Patients between the ages of 40 and 80 years, patients of either gender, with confirmed grade I-III OA of the knee, at least three months of symptoms, and three months of conservative treatment. Patients should have pain that limits their daily activity. Patients who have not received a local steroid injection in the last two months and who are willing to sign an informed consent form and attend regular follow-up appointments were included in the trial.

Exclusion criteria:
Patients with inflammatory, infective, or rheumatoid arthritis, grade IV OA knee, seronegative spondyloarthritis, known hypersensitivity to HA or PRP, venous or lymphatic stasis in the injected limb, and skin disease or infections in the injection site were excluded.

PRP preparation: 20 ml of autologous venous blood is drawn into test tubes containing sodium citrate and centrifuged at 3000 rpm for 15 minutes. The resulting platelet-containing plasma is then transferred to plain test tubes and centrifuged again for 15 minutes at 5000 rpm. The resulting solution in the test tube is composed of upper two-thirds platelet deficient plasma and lower one-third platelet abundant plasma. 20 ml of autologous venous blood produced 3-4 ml of autologous platelet-rich plasma solution.
The subjects participated in the study were randomly allocated into two groups using computer generated numbers. Group PRP-1 consisted of 50 volunteers (50 knees) who got a single injection of PRP. The group hyaluronic acid-2 included 50 volunteers (50 knees) who received hyaluronic acid injections. PRP was injected using a 22-gauge needle in the conventional inter-articular technique. After 15-20 minutes of relaxation, the patients were instructed to bend and extend their knees to ensure that PRP was evenly dispersed within the joint before forming a gel. In the second group, HA under the brand name Synvisc was administered. Synvisc-One® (hylan G-F 20) is a high molecular weight elastoviscous fluid composed of hylan A and hylan B polymers produced from chicken combs. Hylans are hyaluronic acid (sodium hyaluronate) derivatives. The hyaluronan in Hylan G-F 20 is chemically crosslinked, making it distinct. Hyaluronan is a long-chain polymer made up of repeating Naglucuronate-N-acetylglucosamine disaccharide units. Under strict aseptic conditions, Synvisc-One is given as a single intraarticular injection.

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Outcome measures: Patients were followed at 6 weeks, 12 weeks, and 24 weeks to collect data. VAS and WOMAC were assessed prior to the injection and at 6 weeks, 12 weeks, and 24 weeks of follow-up for all patients. An interview was conducted to assess function in all patients using the Persian versions of the Western Ontario and McMaster Universities Arthritis Index (WOMAC) and Visual Analogue Scale (VAS) questionnaires. The WOMAC index consists of 27 items covering three parameters: pain (five), stiffness (two), and physical function (twenty). Each question is assigned a score ranging from zero (none) to four (extreme). The total WOMAC score is the sum of the subscale scores (which range from 0 to 108). Higher ratings indicated worsening situations. The VAS index evaluated the patients' pain. Its scores range from zero (no pain) to ten (the worst possible pain).

Statistical analysis:
To analyze the data, SPSS (Version 25) was employed. The significance level was set at 5% ($\alpha = 0.05$). Quantitative factors are expressed as mean and standard deviation, and qualitative variables are expressed as frequency and percentage. To compare proportions between groups, the chi-square test was performed. To compare mean values between groups, the student t test was utilized.

Results:
The 80 included patients were randomly assigned to PRP (n=40) and HA groups (n = 40). In Group PRP, Out of 40 cases, 29 were males and 11 were females and in Group HA, out of 40 cases, 30 were males and 10 were females. The mean age of patients in group PRP was 50.64±6.93 and in group HA was 52.42±6.45 as shown in Table 1.

Table 1: Demographic details

Variable	Group PRP (n=40)	Group HA (n=40)
Age (Years)	50.64±6.93	52.42±6.45
Sex M/F	29/11	30/10

Majority of the patients in both study groups were noted to be suffering from grade 2 OA, followed by grade 1 and 3 as shown in Table 2

Table 2: OA grading distribution

OA grading	Group PRP (n=40)	Group HA (n=40)
Grade 1	9	11
Grade 2	27	24
Grade 3	4	5

there was reduction in the mean WOMAC score in both the study groups across time-points but the reduction was more in the PRP group compared to HA group which was statistically significant ($p<0.05$) as shown in Table 3

Table 3: comparison of WOMAC score between the groups

WOMAC score	Group PRP (n=40)	Group HA (n=40)	p value
Pre injection	73.45±4.65	71.32±4.73	0.232
Post injection			
6 weeks	61.32±5.32	63.43±6.12	0.002*
12 weeks	46.23±7.34	58.32±5.93	0.03*
24 weeks	32.78±7.84	52.32±4.86	0.004*

*significance

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There was reduction in the mean VAS score in both the study groups across time-points but the reduction was more in the PRP group compared to HA group which was statistically significant ($p<0.05$).

Table 4: comparison of VAS score between the groups

VAS score	Group PRP (n=40)	Group HA (n=40)	p value
Pre injection	7.22±0.97	6.86±0.81	0.076
Post injection			
6 weeks	5.72±0.81	5.64±0.73	0.03*
12 weeks	4.16±0.76	4.63±0.85	0.02*
24 weeks	3.12±0.86	3.64±0.96	0.004*

*significance

Discussion:

The safety and effectiveness of PRP therapy for osteoarthritis (OA) were evaluated in this study. The results showed that intra-articular PRP injections improved patient-reported knee outcomes more than HA injections.

Similar to our study, Cole et al. compared the WOMAC pain score at six, twelve, and twenty-four weeks between the PRP group and the HA group. [17] At all time points, there was no significant difference in the outcome measure between the HA and PRP groups ($p>0.05$).

As shown in study, significant declines in the VAS and WOMAC ratings were found in each group at the 1-month and 3-month follow-ups in the study by Duymus et al.[18] There were no discernible changes between the HA and PRP groups when comparing the VAS scores and total WOMAC scores ($p>0.05$). Although there were minor variations in the scores from the starting values at the 6- and 12-month follow-ups in the PRP and HA groups, the therapeutic impact persisted and there were no statistically significant differences. Once more, all of these results were consistent with those of our current study.

At follow-up, the WOMAC score in the PRP and HA groups in the Su et al trial was shown to be considerably lower. [19] At the first, third, sixth, and twelve months, there were differences between the intra-articular PRP and HA study groups; nevertheless, no discernible difference was found. Up to the sixth month, the study groups' VAS scores were comparable; however, at the 12-month follow-up, the HA group outperformed the intra-articular PRP group in terms of VAS scores. Nonetheless, a study found that for knee OA, intra-osseous PRP injections were superior to HA and intra-articular PRP injections.

Up to three months of follow-up, the mean WOMAC scores in the Huang et al. trial were shown to be statistically equivalent between the PRP group and the HA group.[20] At the 6-month and 12-month follow-up, however, the PRP group's mean WOMAC scores were found to be considerably lower than the HA group's ($p<0.05$). This demonstrated that, even though early follow-up studies similar to ours found equivalent benefits of HA and PRP, the PRP group may have had superior long-term effects. In both the HA and PRP study groups, there was a substantial change in the pain VAS score, and the difference in change was comparable to what we found in our study.

Conclusion:

We found that the PRP injection group performed better than the HA injection group in terms of improving functional outcome in patients with osteoarthritis (OA) of the knee at 6, 12, and 24 weeks of follow-up, based on WOMAC and VAS pain levels.

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