



EFFICACY OF INTRA ARTICULAR SODIUM HYALURONATE AND AUTOLOGUS PLATELET RICH PLASMA FOR MANAGEMENT OF PAIN IN OSTEOARTHRITIS KNEE

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ABSTRACT

Osteoarthritis is a progressive, degenerative joint disorder resulting from the breakdown of articular cartilage. The platelets contain growth factors which have been shown to regulate articular cartilage metabolism. The present study aims to compare the efficacy of a single intra articular injection of autologous Platelet Rich Plasma with Sodium Hyaluronate injection in relieving pain in osteoarthritis knee patients and also assess the change in size of the cartilage by ultrasound imaging of the knee joint. A total of forty patients were included in the study. Pain relief was measured using Visual Analog Scale. Functional improvement was assessed using Oxford Knee score and Patient Satisfaction score. The articular cartilage thickness was assessed by ultrasound. Assessments were done at one, three and six months. Significant pain relief was observed in both the groups from their pre treatment levels at 1 month that persisted up to 6 months of the study period. Although the pain relief and satisfaction was better in patients receiving Intra Articular PRP, the difference in the size of the articular cartilage was not statistically significant in the two study groups.

KEYWORDS : Sodium Hyaluronate, Knee Osteoarthritis, Intra articular Platelet Rich Plasma

BACKGROUND: The approach to management of osteoarthritis (OA) has changed from symptomatic to therapeutic with the availability of drugs, nutritional supplements and techniques that slow the rate of cartilage degeneration and enhance repair. Autologous Platelet Rich plasma (PRP) is a volume of plasma that has a concentration of more than 2,00,000 platelets per milliliter¹. The alpha granules of platelets are a store house of multiple growth factors that have been shown in experimental studies and a few clinical trials to enhance intra articular metabolism and thus may initiate cartilage repair and regeneration^{2,3}. Sodium hyaluronate is a highly viscous glycosaminoglycan naturally present in synovial joints and serves both mechanical as well as metabolic functions^{3,4}. Intra articular injection of Sodium Hyaluronate increases joint lubrication and provides protection from further wear and tear relieving joint pain. It has shown anti inflammatory effects in vitro as well as vivo. Hyaluron also has an influence on the synovial cell metabolism as well as chondrocytes⁴ and may also stimulate endogenous hyaluron production.

The present study aims to compare the effect of a single injection of either sodium hyaluronate or intraarticular PRP on pain relief, cartilage growth as well as over all treatment satisfaction of the patients with improvement of activity status.

MATERIAL AND METHODS

The study was conducted in the Pain and Palliative Care division of the Department of Anesthesiology of Institute of Sciences, Banaras Hindu University. The study was approved by the Institute Ethical Committee. Patients were enrolled in the study when they presented to our Pain Clinic with symptomatic OA Knee. Patients of either sex, in age group of 40 to 70 were included in the study based on clinical examination, plain radiograph Knee joint (AP and Lateral view). Ahlback OA severity Grading was used to assess the severity of OA and only patients with Ahlback grade 1 (joint space narrowing < 3mm) were included in the study. Patients with inflammatory arthritis, neoplasms or history of recent trauma, coagulopathies and severe cardiovascular diseases were excluded from the study. Patients who had received an intra articular injection in the study knee during the preceding 6 months as well as those with a platelet count of less than 1,50,000/mm³ were not included in the study.

Out of the 96 patients who came to our pain clinic from January 2016 to December 2017, 40 met the study criteria and were randomly selected for intervention. Patients were divided into two groups, PRP and SH based on the injection received. Informed consent was obtained from all participants. All patients underwent complete blood count, erythrocyte sedimentation rate, C reactive protein and anti CCP evaluation. Knee joint was assessed using x ray (both antero - posterior and lateral films) and ultrasound.

Platelet rich plasma was prepared from the patients blood using PRP Centrifuge. 18 ml of blood with 2 ml anticoagulant was centrifuged two times (first at 1800 rpm for 15 minutes and the second at 3500 rpm) to get PRP of 2 to 3 ml. This was taken in another syringe carefully from the centrifuged container and 0.5 ml of calcium chloride was added to PRP for activation of the platelets immediately before injecting this into the knee joint. A total of 2.5 ml of PRP was injected in all

cases. Factory made 1 ml prefilled syringes with high molecular weight Hyalurons were used. The patients were randomly allocated into either PRP or SH group.

Under all aseptic precautions, after infiltrating the site with local anesthetic, 22 gauge spinal needle was inserted into the knee joint space using 'Triangle technique' as described by Lockman⁵. Fluoroscopic images of AP and Lateral view of the Knee were obtained to confirm the needle position in to the knee joint space. During the procedure the patients were monitored noninvasively using Pulse Oximetry and NIBP (non invasive blood pressure). A single injection of intra articular PRP (IA PRP) or IA sodium hyaluronate (IA SH) injection was given. Two ml of either intra articular hyaluronate or intra articular PRP was injected in the affected knee after confirmation of needle position. Patient vitals were monitored intra operatively as well as one hour post operatively.

Follow up

In follow up, all patients were evaluated for the thickness of knee cartilages using ultrasound. Sonosite machine with leniar hiferquency probe of 10 – 15 mega hertz was used for the measurement. Size of the cartilage was measured in the medial, lateral and central compartments of the affected knee. VAS for subjective pain severity and oxford knee score for improvement in function of knee at one month, 3 months and 6 months post injection.

The data was statistically analysed using SPSS for Windows version 16.0 software. For non continuous data, chi square test was used. The mean and standard deviation of parameters studied during the observation period were calculated for two treatment groups and compared using ANOVA test. The critical value of 'p' indicating the probability of significant difference was taken as < 0.05 for comparisons.

RESULTS

All of the forty patients that received the intra articular injection, were followed up till 6 months of the study period. Demographic profile of the two groups, PRP and SH, were similar (Table 1). There was no significant difference in the baseline pain intensity as measured by VAS and Oxford Knee score in the two study groups before the intervention. The knee pain improved in both the groups after the intra articular injection from their pre injection scores. When the relief of PRP group was compared to SH group, the decrease in VAS at 6 months (PRP group 3.25± 0.444 versus 4.10±0.641 in SH group) became statistically significant (p<0.01). However, this difference was not significant at one and three months respectively (figure 1).

The mean value of oxford knee score before treatment in the two groups was comparable (34±0.023 in PRP group Vs 33±0.981) but the score did not show any statistically significant change at 1 month (32±0.555 in PRP group Vs 29± 0.641 in SH group), 3 months (30±0.522 in PRP group Vs 30±0.081 in SH group) as well as at 6 months (27±0.087 in PRP group Vs 28 ± 0.041 in SH group) after intervention.

In the assessment of subjective pain relief, p value was 0.0145 when pre-treatment values were compared to post treatment values in both the groups. 70 %patients reported good pain relief at the end of the study with PRP whereas only 25% patients in the SH group reported good pain relief. None of the patients reported excellent pain relief.

The assessment of cartilage thickness by USG did not show a significant increase in the size of the cartilage from the base line at one month. At 3 months, 8 (40%) patients in SH group and 9 (45%) patients in group PRP reported an increase in medial compartment cartilage thickness. Five patients (25%) in SH group and six patients (30 %) in PRP group showed increase in size of lateral compartment cartilage. Thirteen Patients (65%) SH group and eleven (55%)patients in PRP group had increase in the size of the central compartment. Improvement in central compartment thickness was more as compared to other compartments. Similar increase in cartilage size was evident even at 6 months. But this increase was not statistically significant when both the groups were compared with each other at 6 months.

Adverse effects in the form of Joint stiffness and swelling were observed in both the groups. In two patients who received autologous PRP, there was swelling of the joint that subsided in 10 - 15 days . Stiffness or soreness of the joint was present in 6 patients (30%) in SH group and 2 patients (10%) in PRP group at one month follow up. This improved completely at 6 months follow up.

DISCUSSION

PRP is another new tool in the armamentarium against Knee OA that can be quickly and easily obtained from autologous blood. The alpha granules of platelets contain growth factors like platelet-derived growth factor (PDGF), transforming growth factor (TGF), Chondrocyte Growth factor, interleukin (IL), platelet-derived angiogenesis factor (PDAF), vascular endothelial growth factor (VEGF) and fibronectin⁹. Hyaluronic acid is a component of mammalian synovial joints and functions to maintain joint structure by preventing articular cartilage damage due to its viscoelastic properties. It has also been shown to stimulate chondrocyte growth¹⁰. Hence this study was designed to compare the effects of the two intra articular injections. We found that the pain relief was better in the PRP group as compared to SH group and this relief was translated in terms of functional improvement as shown by oxford knee score as well as patient satisfaction score. However this study fails to support the hypothesis that PRP causes growth of cartilage as this was also seen in SH group . Comparative study of PRP and Sodium Hyaluronate has been done by **Kon¹¹ et al** in 150 patients in early as well as severe OA in young and elderly patients and they found that younger PRP group with early OA had better pain relief as compared to the group with advanced disease and sodium hyaluronate injection . No attempt was made to measure the cartilage size in their study. **Patel¹² et al** also studied the effect of PRP on OA Knee and their results also showed good pain relief in PRP Group and they also found that within a year repeated injections are as good as a single injection. **Volkan et al¹³** observed the short term results of IA PRP with SH in early OA and found promising results similar to our study.

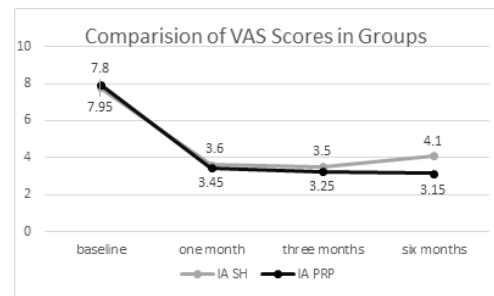
CONCLUSION

From the present study it can be concluded that IA PRP causes better pain relief as compared to IA SH , however there is no statistically significant difference in the size of the articular cartilage with the use of intra articular PRP.

Table 1. Baseline characteristics of the patients included in the study

Baseline characteristics	Group 1 (n=20)	Group 2 (n=20)
Mean Age (years)SD	53.95±6.72	53.30±6.71
Gender (M: F)	8:12	10:10
VAS (Visual Analog Score)	7.8±0.41	7.95±0.51
OKS (Oxford Knee Score)	23.35±0.73	22.45±0.07
FAC (Femoral Articular Cartilage) thickness in cm on medial side	0.071±0.02	0.070±0.01
FAC (Femoral Articular Cartilage) thickness in cm on lateral side	0.076±0.01	0.078±0.01
FAC (Femoral Articular Cartilage) thickness in cm in intercondylar area	0.079±0.02	0.079±0.02

Figure 1. Comparison of visual analogue score within the study groups



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