

ORIGINAL RESEARCH

Single blind randomized study for comparison of efficacy of injection of platelet rich plasma versus high molecular weight viscous supplementation in osteoarthritis knee**¹Dr. Dharam Singh, ²Dr. Rajesh Kapilla, ³Dr. Varinder Joshi**¹Professor, ²Professor and Head, ³Junior Resident, Department of Orthopaedics, Government Medical College, Amritsar, Punjab, India**Corresponding author**

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Abstract**Background:** Osteoarthritis [OA] is a degenerative joint disorder of synovial joints. This study was done to evaluate the efficacy of injection of platelet rich plasma versus high molecular weight viscous supplementation in osteoarthritis knee.**Materials & Methods:** Thirty patients were chosen and randomly divided into two groups of 15 each. Patients with same K L grade in both knees were chosen for study. In group A, patients were given platelet rich plasma in right knee and high molecular weight viscous supplement in left knee. In group B, patients were given high molecular weight viscous supplement in right knee and platelet rich plasma in left knee. Comparison was done between the PRP receiving group and Hyaluronic acid receiving group. Comparison was done on the basis of reduction in pain and discomfort as assessed by visual analogue scale and consumption of analgesic as oral paracetamol consumption by patients. No of paracetamol tablets consumed by patients in a period of 30 days prior to visit at 1, 3 and 6 months of follow-up were noted.**Results:** Age group <40 years comprised of 3 (10%). Age group 41-50 years had 9 (30%). Age group 51-60 years had 11 (36.7%) patients. Age group >60 years had 7 (23.30%) patients. The mean±SD age was 50.2± 7.26 years. Out of 30 patients, males were 21 (70%) and females were 9 (30%). The mean± SD VAS was 75.46±8.1 in PRP patients and 40.53±5.6 in HA patients at 1 month. The difference was significant (P< 0.05). The mean± SD VAS was 54.24±6.2 in PRP patients and 64.78±9.4 in HA patients at 3 months. The mean± SD VAS was 43.93±4.6 in PRP patients and 70.61±8.2 in HA patients at 6 months. The mean paracetamol consumption at 1 month in PRP patients was 13.5±4.1 and in HA patients was 7.3± 1.2. The difference was significant (P< 0.05). The mean paracetamol consumption at 3 months in PRP patients was 9.2±2.8 and in HA patients was 12.4± 4.6. The mean paracetamol consumption at 6 months in PRP patients was 5.67±1.3 and in HA patients was 15.4± 3.8. The difference was significant (P< 0.05).**Conclusion:** The first line of treatment for knee osteoarthritis should be platelet rich plasma (PRP) injections. PRP may be combined with viscous supplement (HA) injection as a worthwhile option for effective treatment of knee osteoarthritis.

Key words: Platelet rich plasma, High molecular weight hyaluronic acid , Viscous supplementation, Paracetamol , Knee Osteoarthritis , Knee .

Introduction

Osteoarthritis [OA] is a degenerative joint disorder of synovial joints. Osteoarthritis is one of the most common form of musculoskeletal disease worldwide. It involves large weight bearing joints such as knee. Osteoarthritis is a poor name for degenerative joint disease. Articular cartilage is involved more than bone and inflammation is secondary to the disease and not the cause.¹ It is a clinical syndrome of joint pain with multifactorial etiopathogenesis that is characterized by gradual loss of articular cartilage, compromising a patient's functional status as it results in joint pain and stiffness. Globally, osteoarthritis is the eighth leading cause of physical impairment with the knee being the most commonly affected joint.² Approximately 40 % of population of more than 70 years show osteoarthritis, in which nearly 2 % have pain and disability. Because of the increased life span and obesity, the prevalence of osteoarthritis is on the rise in Indian population. Osteoarthritis is often referred to as 'wear and tear arthritis, resulting from accumulated minor traumas to joints as age progresses. It is age related disease affecting elderly population. Osteoarthritis in weight bearing joints is strongly linked to body mass index. As life expectancy increases and the rate of obesity reach epidemic proportions, osteoarthritis knee has become increasingly common.³

The pathology of OA provides evidence of the involvement of many joint structures in disease. Cartilage initially shows surface fibrillation and irregularity. As disease progresses, focal erosions develop there, and these eventually extend down to the subjacent bone. With further progression, cartilage erosion down to bone expands to involve a larger proportion of the joint surface, even though OA remains a focal disease with non- uniform loss of cartilage.⁴ After an injury to cartilage, chondrocytes undergo mitosis and clustering. Anti-inflammatory properties of platelet concentrates promote tissue healing. This aspect can be mainstay in dealing with articular cartilage because lowering the inflammation in the synovial tissues lead to reduction of matrix – metalloproteinases which are cartilage matrix degrading enzymes.⁵ Endogenous Hyaluronic acid [HA] is essential to integrity, health and normal functioning of synovial fluid. Its molecular weight ranges from 2 to 10 million daltons and it helps maintain viscoelasticity to the synovial joint fluid.⁶ This study was done to evaluate their efficacy of injection of platelet rich plasma versus high molecular weight viscous supplementation in osteoarthritis knee.

Materials & Methods

The present study comprised of 30 patients who presented with complaints of bilateral knee pain in out-patient department [OPD] in the department of orthopaedics, Guru Nanak Dev Hospital Amritsar attached to Govt Medical College Amritsar during study period. After obtaining Institutional Ethics Committee clearance and written informed consent was obtained.

Demographic data, brief history was taken along with clinical examination and routine investigations [complete blood count, serology, bleeding and clotting time, CRP, ESR, serum uric acid] was done for all the patients enrolled in the study. Thirty patients were chosen and randomly divided into two groups of 15 each. Patients with same K L grade in both knees were chosen for study.

In group A, patients were given platelet rich plasma in right knee and high molecular weight viscous supplement in left knee. In group B, patients were given high molecular weight viscous supplement in right knee and platelet rich plasma in left knee.

Efficacy of PRP and viscous supplementation was assessed on the basis of relief from pain. Pain was assessed as per VAS scale (Visual Analogue Scale).

Radiological investigation and OA staging of both knees in standing position [stress view] was done for all patients. Based on Kellegren – Lawrence system of grading, radiological staging was done. Patients pain at the start of treatment was considered a 100 and at each visit patient was asked to mark a point on the line and then measured with the scale. Thus, pain severity was quantified. A single intraarticular injection of 6 ml platelet rich plasma was administered in chosen knee. PRP was administered within 30 minutes of preparation in blood bank without any prior activation [using UV rays etc]. A single intra-articular injection of high molecular weight hyaluronic acid was administered in chosen knee joint. A single 6 ml injection was given. Commercially available product was used.

Both injections were administered in major operation theatre after thorough scrubbing, painting with povidine iodine followed by surgical spirit and drapping of the knee to be injected. All sterile precautions were followed to prevent septic arthritis, one of the dreaded complications of intra-articular injections. Following injection, puncture site was covered with sterilized dressing.

VAS scale is a unmarked line drawn with ends marked as zero and hundred. All patients in the study were followed up at 1, 3 and 6 months after the intra-articular injection. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I: Age distribution

Age group	Number	Percentage
≤40years	3	10
41-50years	9	30
51-60years	11	36.7
>60 years	7	23.3
Mean± SD	50.2± 7.26	

Age group <40 years comprised of 3 (10%). Age group 41-50 years had 9 (30%). Age group 51-60 years had 11 (36.7%) patients. Age group >60 years had 7 (23.30%) patients. The mean±SD age was 50.2± 7.26 years. The difference found to be non-significant (P> 0.05).

Table II: Gender distribution

Gender	Number	Percentage
Male	21	70
Female	9	30
Total	30	100

Out of 30 patients, males were 21 (70%) and females were 9 (30%). The difference found to be significant (P< 0.05).

Table III: Comparison of VAS at 1 month

Groups	Mean	SD
PRP	75.46	8.1
HA	40.53	5.6
P value Unpaired t Test	0.028	

The mean± SD VAS was 75.46±8.1 in PRP patients and 40.53±5.6 in HA patients at 1 month. The difference was significant (P< 0.05).

Table IV: Comparison of VAS at 3 months

Groups	Mean	SD
PRP	54.24	6.2

HA	64.78	9.4
P value Unpaired t Test		0.042

The mean± SD VAS was 54.24±6.2 in PRP patients and 64.78±9.4 in HA patients at 3 months. The difference was significant (P< 0.05).

Table V: Comparison of VAS at 6 months

Groups	Mean	SD
PRP	43.93	4.8
HA	70.61	8.2
P value Unpaired t Test		0.051

The mean± SD VAS was 43.93±4.6 in PRP patients and 70.61±8.2 in HA patients at 6 months. The difference was significant (P< 0.05).

Table VI: Analgesic consumption at 1 month

Groups	Mean	SD
PRP	13.5	4.1
HA	7.3	1.2
P value Unpaired t Test		0.04

The mean paracetamol consumption at 1 month in PRP patients was 13.5±4.1 and in HA patients was 7.3± 1.2. The difference was significant (P< 0.05).

Table VII: Analgesic consumption at 3 months

Groups	Mean	SD
PRP	9.2	2.8
HA	12.4	4.6
P value Unpaired t Test		0.057

The mean paracetamol consumption at 3 months in PRP patients was 9.2±2.8 and in HA patients was 12.4± 4.6. The difference was significant (P< 0.05).

Table VIII: Analgesic consumption at 6 months

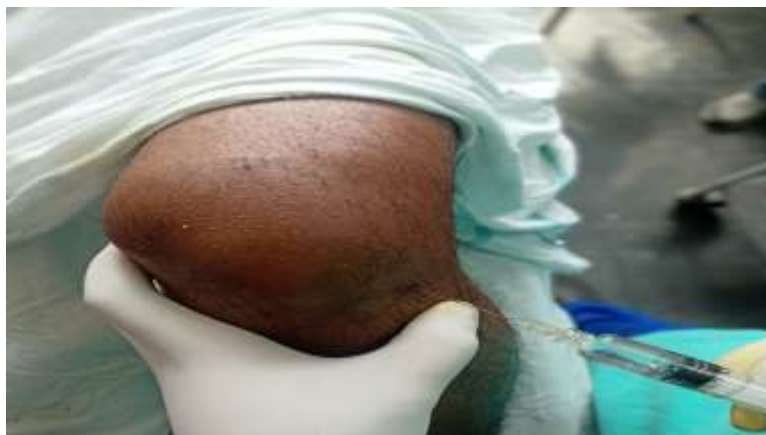
Groups	Mean	SD
PRP	5.67	1.3
HA	15.4	3.8
P value Unpaired t Test		0.021

The mean paracetamol consumption at 6 months in PRP patients was 5.67±1.3 and in HA patients was 15.4± 3.8. The difference was significant (P< 0.05).

Case



RIGHT KNEE PRP

**LEFT KNEE HA**

Discussion

Osteoarthritis is a disorder of synovial joints characterized by focal loss of hyaline cartilage with proliferation of new bone and remodelling of joint contour, mainly due to uncoupling of balance between cartilage regeneration and degeneration.⁷ Osteoarthritis is a dynamic repair process of synovial joints that may be triggered a variety of insults.^{8,9} The present study was conducted on 30 patients who presented with complaints of bilateral knee pain in out-patient department [OPD] in the Department of Orthopaedics, Guru Nanak Dev Hospital Amritsar attached to Govt Medical College Amritsar. Patients with same K-L grade in both the knees were selected for the study.

We found that age group <40 years comprised of 3 (10%). Age group 41-50 years had 9 (30%). Age group 51-60 years had 11 (36.7%) patients. Age group >60 years had 7 (23.30%) patients. The mean±SD age was 50.2± 7.26 years. Sanchez et al¹⁰ assessed effectiveness of intra-articular injections of an autologous preparation rich in growth factors (PRGF) for knee OA. There were two groups. Each group included 30 patients with OA of the knee, matched according to age, sex, body mass index and radiographic severity. Both treatments were based on three weekly injections. Clinical outcome was examined using the WOMAC questionnaires prior to treatment and at 5 weeks after treatment. The observed success rates by week 5 for the pain subscale reached 33.4% for the PRGF group and 10% for the hyaluronan group. The difference was attributed exclusively to the treatment modality, $p = 0.004$. The percent reductions in the physical function subscale and overall WOMAC at 5 weeks were also associated solely with treatment modality in favour of PRGF, $p = 0.043$ and $p = 0.010$ respectively.

We found that out of 30 patients, males were 21 (70%) and females were 9 (30%). The mean± SD VAS was 75.46±8.1 in PRP patients and 40.53±5.6 in HA patients at 1 month. The mean± SD VAS was 54.24±6.2 in PRP patients and 64.78±9.4 in HA patients at 3 months. The mean± SD VAS was 43.93±4.6 in PRP patients and 70.61±8.2 in HA patients at 6 months. Kon et al¹¹ in 2010 in their study one hundred consecutive patients, affected by chronic degenerative condition of the knee, were treated with PRP intra-articular injections (115 knees treated). The procedure consisted of 150-ml of venous blood collected and twice centrifugated 3 PRP units of 5 ml each were used for the injections. Patients were clinically prospectively evaluated before and at the end of the treatment, and at 6 and 12 months follow-up. IKDC, objective and subjective, and EQ VAS were used for clinical evaluation. A statistically significant improvement of all clinical scores was obtained from the basal evaluation to the end of the therapy and at 6-12 months follow-up ($P < 0.0005$). The results remained stable from the end of the therapy to 6 months follow up, whereas they became significantly worse at 12 months follow up ($P = 0.02$), even if still significantly higher respect

to the basal level ($P < 0.0005$). The preliminary results indicate that the treatment with PRP injections is safe and has the potential to reduce pain and improve knee function and quality of life in younger patients with low degree of articular degeneration.

We found that the mean paracetamol consumption at 1 month in PRP patients was 13.5 ± 4.1 and in HA patients was 7.3 ± 1.2 . The mean paracetamol consumption at 3 months in PRP patients was 9.2 ± 2.8 and in HA patients was 12.4 ± 4.6 . The mean paracetamol consumption at 6 months in PRP patients was 5.67 ± 1.3 and in HA patients was 15.4 ± 3.8 . Sampsons et al¹² in 2010 evaluated the clinical effects of intraarticular platelet-rich plasma (PRP) injections in a small group of patients with primary and secondary osteoarthritis. 14 patients with primary and secondary knee osteoarthritis received three platelet-rich plasma injections in the affected knee at ~4-week intervals. Outcome measures included the Brittberg-Peterson Visual Pain (Visual Analog Scale [VAS]), Activities, and Expectations score and the Knee Injury and Osteoarthritis Outcome Scores at pre-injection visit at 2-, 5-, 11-, 18-, and 52-wk follow-up visits. There were no adverse events reported. The study demonstrated significant and almost linear improvements in Knee Injury and Osteoarthritis Outcome Scores, including pain and symptom relief. Brittberg-Peterson VAS showed many improvements including reduced pain after knee movement and at rest. Cartilage assessment was limited because of the small sample size. The majority of the patients expressed a favorable outcome at 12 months after treatment.

The limitation of the study is small sample size.

Conclusion

Authors found that the first line of treatment for knee osteoarthritis should be platelet rich plasma (PRP) injections. PRP may be combined with viscous supplement (HA) injection as a worthwhile option for effective treatment of knee osteoarthritis. Limitation of the study was a small sample size. More randomized controlled studies with large numbers of patients are needed to confirm these findings and to investigate the persistence of the beneficial effects observed.

Potential Conflict Of Interests

The authors have no conflicts of interest and received no sponsorship for any of the products used in the trial.

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