

A Study to Assess Pain Relief and Functional Outcome in Knee Osteoarthritis (OA) Cases Treated by Intra-Articular Injection of Platelet-Rich Plasma (PRP)

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Abstract

Aim: The aim of the present study was to assess pain relief and functional outcome in knee osteoarthritis (OA) cases treated by intra-articular injection of platelet-rich plasma (PRP).

Methods: All patients attending the Department of Orthopaedics, SKMCH, Muzaffarpur, Bihar, India 40 to 70 years age group with knee pain included according to the inclusion and exclusion criteria during the study period. The sample size was 70 knees. A detailed clinical history of the patient was elicited. A general physical examination and Local examination of the affected knee was done and basic investigations done.

Results: The efficacy was compared in respect to age, sex, body mass index and the grades of osteoarthritis in the study. It shows that the majority of patients were females. There was a significant improvement in all scores over time compared to the pre-treatment value ($p < 0.001$). The mean baseline VAS was 7.48, which was found to be significantly reduced at the end of follow up to 3.6 (48.1% reduction in pain).

Conclusion: Intra-articular injection of PRP is effective in treating early grade I and II osteoarthritis knee. The study shows outcome with significant improvement of symptoms in patients with age group between 40 and 60. Our study group didn't required analgesics following 1 week after injections till follow up of 6 months. Complications like infection, stiffness and effusions is nil in this study. Unlike steroids it doesn't increases the risk of infection in future procedures.

Keywords: Knee osteoarthritis, Intra-articular injection, Platelet-rich plasma, Functional outcome

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Introduction

Osteoarthritis of the knee is one of the main causes of musculoskeletal disability, and is characterized by gradual abrasion of the articular cartilage, osteophyte formation, subchondral bone sclerosis, and inflammation of the joint. The number of patients with osteoarthritis continues to increase as the world population ages. In the USA, knee osteoarthritis affects more than 20% of individuals older than 45 years. [1] In Japan, the prevalence of age-associated diseases of the musculoskeletal system has also increased, and it was estimated that, in 2009, radiographic osteoarthritis was present in 25,300,000 individuals (8,600,000 men and 16,700,000 women) aged 40 years or older, while symptomatic osteoarthritis was present in approximately 7,800,000 individuals. [2] In addition, the Japanese lifestyle differs from that in Western countries, and activities of Japanese individuals generally require a greater range of

motion. Common movements used in daily life in Japan include floor-sitting, squatting, and kneeling (e.g., seiza-sitting). [3-6]

Clinical guidelines recommend various non-surgical procedures to treat knee osteoarthritis. [7] Non-pharmacological treatments include: patient education and self-management with exercise; weight reduction; use of crutches and bracing; shoe and insole modification; and local cooling. Pharmacologic therapies include the use of paracetamol, non-steroidal anti-inflammatory drugs, and opioids. If orally administered drugs are ineffective, intra-articular (IA) injection of corticosteroids and hyaluronic acid (HA) is the next preferred non-operative treatment. [8] IA-HA is widely used in Japan because it is strongly recommended in the guideline for the management of knee osteoarthritis, published by the Japanese

Orthopedic Association (JOA). However, IA-HA is not recommended in the corresponding guideline published by the American Academy of Orthopedic Surgeons. [9]

Intra articular PRP acts by limiting damage and promote healing mechanisms of cartilage involved. It acts by its anti-inflammatory, anabolic and local milieu altering mechanism through release of growth factor present in the platelets.¹⁰ It will increase the cartilage to repair itself, hence autologous preparations are very useful in treating degenerative conditions.

The aim of the present study was to assess pain relief and functional outcome in knee osteoarthritis (OA) cases treated by intra-articular injection of platelet-rich plasma (PRP).

Materials and Methods

All patients attending the Department of Orthopaedics, SKMCH, Muzaffarpur, Bihar, India for 12 months, 40 to 70 years age group with knee pain included according to the inclusion and exclusion criteria during the study period. The sample size was 70 knees. A detailed clinical history of the patient was elicited. A general physical examination and Local examination of the affected knee was done and basic investigations done. Plain antero posterior and lateral weight bearing radiograph of bilateral knee was taken. On the basis of the radiographs Kellgren Lawrence grading was done.

Inclusion Criteria

1. Both male & female patient of age between 40 and 70 years.
2. Body mass Index (BMI) <30.
3. Normal complete blood count (CBC) and coagulation control.
4. Patients with symptomatic osteoarthritis of knees (Kellgren Lawrence scale grade 1-2 based on Radiographic findings).
5. Patients with no symptomatic relief with analgesics and physiotherapy.
6. Patients who gave consent for treatment with PRP as per our protocol.
7. Minimum follow up of 6 months.

Exclusion Criteria

1. Age less than 40 and over 70 years.
2. History of presence of neoplasm, any infection or active wound over the knee.
3. Secondary osteoarthritis.
4. Autoimmune and platelet disorders.
5. History of intra articular steroid injections to knee.
6. Kellgren – Lawrence scale grade 3 and 4 based on radiographic findings.

Preparation

Under all aseptic precautions, about 20 ml of blood was extracted from the antecubital vein for single knee. In case of both knees, about 40 ml of blood was extracted. Extracted blood was collected in a sterile sodium citrate coated vial. With no delay, the blood was centrifuged at the rate of 1500 rpm for 15 minutes, twice on a table top centrifuge at blood bank, department of transfusion medicine, MGMCRI and the blood will be separated into PRP and residual red blood cells with the buffy coat. 5-6 ml of PRP from the centrifuged blood was separated.

Injection Technique

Patient in supine position. Respective knee painted and draped. An 18 gauge needle was inserted in the superolateral aspect of the knee joint into the suprapatellar pouch. With a sterile syringe, joint effusion, if any was aspirated. 5 ml PRP were injected into the joint. Sterile dressing was applied at the injection site. Knee was mobilized for few times after injection and compression bandage was applied.

Post Injection Protocol

Patients were allowed to weight bear after 24 hours. A strict vigilance was done in view of adverse reactions such as pain following injection, joint swelling or any systemic reaction. If patient experiences pain, ice pack application given, if not subsided opioid analgesics were given for pain. Patients were asked to come for second injection at 4 weeks interval. Patients were followed at 1st, 3rd and 6th month following the second injection. During every follow up visit, the following outcomes were noted. VAS score and WOMAC score on the day of follow up visit. Adverse reactions if any.

Results

Table 1: Baseline Characteristics

Mean Age	55.65 ±7.03
Sex	
Male	20
Female	50
Mean Height	157.63±7.92
Mean Weight	60.33±7.373
Mean BMI	24.04±3.358
WOMAC SCORE	
Mean Pain	17.04±0.856
Mean Stiffness	5.98±0.82
Mean Physical Function	56.56±4.87
Mean Total WOMAC	79.58±5.41
Mean VAS	7.48±0.788

The efficacy was compared in respect to age, sex, body mass index and the grades of osteoarthritis in the study. It shows that the majority of patients were females.

Table 2: Visual analogue score

Visual Analogue Score	Mean	SD	H Value	P Value
Before PRP injection	7.48	0.788		
At 1st Month follow up	5.22	0.615	152.72	<0.0001
At 3rd Month follow up	3.76	0.624		
At 6th Month follow up	3.6	1.01		

There was a significant improvement in all scores over time compared to the pre-treatment value ($p < 0.001$). The mean baseline VAS was 7.48, which was found to be significantly reduced at the end of follow upto 3.6 (48.1% reduction in pain).

Discussion

Osteoarthritis (OA) of knee is an idiopathic, progressively debilitating chronic degenerative disease of joint. Osteoarthritis of knee is common and it's in rise due to lifestyle modification in modern era. [11-13] Individuals affected with osteoarthritis clinically presents with deep aching joint pain, joint swelling, and reduced joint range of motion and crepitus of joint. Weight bearing antero-posterior and lateral radiograph may show narrowing of joint space, osteophyte formation, subchondral cyst and sclerosis. [14] Treatment options range from conservative method including physiotherapy and pharmacotherapy to surgical procedures including arthroscopic debridement, osteotomy and knee arthroplasty. Despite large options available, there is no standard or curative treatment till date. [15]

Filardo et al. used 2 injections of 5 ml volume at 4 weeks interval. [16] Cerza et al. used 4 injections at 1 week interval of volume 5.5 ml. [17] Kon et al. used 3 injections at 2 week intervals of volume 5 ml. [18] Spakova et al. used 3 injections at 1 week interval with volume of 3 ml. [19] The efficacy was compared in respect to age, sex, body mass index and the grades of osteoarthritis in the study. It shows that the majority of patients were females.

There was a significant improvement in all scores over time compared to the pre-treatment value ($p < 0.001$). The mean baseline VAS was 7.48, which was found to be significantly reduced at the end of follow upto 3.6 (48.1% reduction in pain).

The findings reported by Yang et al. in 2021 indicated that PRP abates IL-1 β -induced chondrocyte apoptosis and inflammation at least partly through inhibiting hypoxia-inducible factor 2 α . [20] In an in vivo OA model using PRP in rats, Sun et al. found that microRNA-337 and microRNA-375 were involved in delaying OA progression by affecting inflammation and apoptosis. [21] According to Sheean et al., the biologic activity of PRP is manifold: platelet α granules promote the release of various growth factors, including VEGF and TGF- β , and inflammation is modulated through the inhibition of the nuclear factor- κ B pathway. [22] Shane Anderson and Loeser in their review showed that the age-related changes in the musculoskeletal system play a significant role in increasing the susceptibility to OA. [23] These factors encompass joint injuries, obesity, genetic predisposition, and anatomical features that influence joint mechanics. [24] The authors further found that natural aging process also contributes to the development of OA by introducing changes in joint tissues. This includes cell senescence, which leads to the development of the senescent secretory phenotype, as well as alterations in the joint matrix, such as the formation of advanced glycation end-products that affect the mechanical properties of joint tissues. The authors

concluded that given the aging population and the rising prevalence of OA risk factors like obesity, the ability to impede OA progression in older adults holds significant public health implications. Similar age-related changes in joints, particularly load-bearing joints, have also been reported by the authors such as Loeser²⁴ and Hawker and King. [25]

Conclusion

Intra-articular injection of PRP is effective in treating early grade I and II osteoarthrosis knee. The study shows outcome with significant improvement of symptoms in patients with age group between 40 and 60. Our study group didn't required analgesics following 1 week after injections till follow up of 6 months Complications like infection, stiffness and effusions is nil in this study. Unlike steroids it doesn't increases the risk of infection in future procedures. This is a minimally invasive procedure with better outcome improving the quality of life in patients which gives symptomatic pain relief and delays the need for surgical intervention

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