

Functional outcomes of intra-articular platelet rich plasma injections in early osteoarthritis of knee

¹Mudasir Nazir Bhat, ²Sayar Ahmad Mantoo, ³Imtiyaz Ahmad Beigh,

⁴Irshad Ahmad Ganie, ⁵Yogesh Ahuja

Senior Resident, Deptt. of Orthopaedics Sggrim & HS Indires Hospital Patel Nagar Dehradun 248001
Dehradun

*Corresponding Author:

Sayar Ahmad Mantoo

Senior Resident, Deptt. of Orthopaedics Sggrim & HS Indires Hospital Patel Nagar Dehradun 248001

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ABSTRACT

Purpose of the study: Platelet-rich plasma (PRP) which is rich in growth factors will help in cartilage regeneration when administered in patients with symptomatic early osteoarthritis knees.

Patients and method: 50 Patients with grade I-III knee OA based on the Kellgren-Lawrence (K-L) classification with chronic knee pain were enrolled in this study. All patients who completed 3 doses of intraarticular PRP injections administered at intervals of 3 weeks were analysed. The patients' pain was evaluated using a resting and activity visual analog scale (VAS) on day 0, and at week 3, 6, 12 and 24.

Results: Results were analysed on the basis of following scores:

-WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index) ¹

-KSS (Knee Society Score) ²

-VAS (Visual Analogue Scale)

There were significant improvements in all scores after treatment as compared to the pre-treatment values with no adverse effects.

Conclusions: PRP injection appears to be effective in early symptomatic OA knees. The results suggests that autologous PRP can be used as an effective and safe method in the treatment of the early stages of osteoarthritis. Three injections yielded significantly better results in short-term follow-up.

Keywords: Autologous PRP, Osteoarthritis knee

INTRODUCTION

Osteoarthritis is a slowly progressive disease of diarthrodial (synovial) joints characterized pathologically by focal degeneration of articular cartilage, subchondral bone thickening (sclerosis), marginal osteophytes and joint deformity. Knee OA is clinically characterized by recurrent episodes of pain, swelling, stiffness and progressive loss of motion. Radiographically there is joint space narrowing, osteophytes, subchondral sclerosis and cysts.

Knee joint is most common site for OA³. Platelet rich plasma (PRP) since its discovery in the 1970s has gained popularity in many different medical fields such as cosmetic surgery, dentistry, sports medicine

and pain management. It is a simple, low-cost and minimally invasive method that provides concentrate of autologous growth factors (GFs) that are beneficial to enhance tissue and cartilage regeneration⁴. Platelet-rich plasma injections aim to promote cartilage repair and relieve osteoarthritic symptoms, potentially delaying the need for joint replacement surgery. These growth factors of PRP stimulate chondrocyte proliferation, required for cartilage repair. The efficacy of certain growth factors in healing various injuries and the concentrations of these growth factors found within PRP are the theoretical basis for the use of PRP in tissue repair⁵. The platelets collected in PRP are activated by the

addition of thrombin and calcium chloride, which induces the release of the growth factors from alpha granules. Human chondrocytes exposed to platelet-rich plasma demonstrated less interleukin-1 β inhibition of collagen 2 gene expressions, and decreased nuclear factor-B activation, which are pathways of osteoarthritis pathogenesis⁶.

Patients and methods:

Inclusion criteria

- 40-65 years of age
- Early stages of osteoarthritis knee (Kellgren Lawrence grade 1-2)

Exclusion Criteria

- Kellgren Lawrence grade 4 of osteoarthritis knee
- Patients who have received any other intraarticular therapies

- Previous surgical intervention for cartilage regeneration.
- Patients having rheumatoid arthritis.

50 patients were treated with 3 doses of intra-articular injections of autologous PRP at 3-weekly intervals and were followed for a minimum of 6 months. Evaluative scores were collected at pretreatment and at 6 months posttreatment. Before giving PRP injection each patient was clinically evaluated for severity of pain, deformity, range of motion at knee joint, activity level and functional capabilities by using KSS score, WOMAC score and VAS score. Radiological assessment was done using AP and lateral radiograph of the knee joint .

Results

Following results were observed while treating 50 patients with autologous PRP intraarticular injection with symptomatic knee OA.

Table 1: Distribution of cases by age

Age (years)	No. of patients	Percentage
40 – 50	31	62%
50 – 60	13	26%
>60	6	12%

Table 2: Distribution of cases by sex

Sex	No. of cases	Percentage
Female	32	64%
Male	18	36%

Table 3: Distribution of cases by side (symptomatic knee)

Side	No. of cases	Percentage
Right	18	36%
Left	23	46%
Bilateral	9	18%

Table 4: Distribution of cases by grade of OA (KL grade)

KL grade	No. of cases	Percentage
Grade 1-2	37	74%
Grade 3	13	26%

Table 5: Functional grading by using WOMAC score

WOMAC Score	Pretreatment(no. of Cases)	At 3month	6 month
<30	8	36	37
30-50	32	7	8
>50	10	7	5

WOMAC Score: The Western Ontario and MacMaster Universities osteoarthritis index is one of the most widely used scoring system, used to assess pain, stiffness, and physical function in patients with hip and/or knee osteoarthritis. The WOMAC score consists of 24 items divided into 3 scales: - pain, stiffness and physical function. The mean WOMAC scores before treatment initiation were < 30 in 8 cases, 30- 45 in 32 cases, > 50 in 10 cases, and at follow-up after 3 months were <30 in 36 cases, 30-5- in 7 cases, > 50 in 7 cases. At 6- month follow -up WOMAC scores were <30 in 37 cases , 30-50 in 8 cases, > 50 in 5 cases showing significant improvement.

Table 6: Functional grading by using VAS scale

VAS Scale	Pretreatment (no. of Cases)	At 3 month	At 6 month
0 -3	6	5	4
3 -6	15	36	42
6 -10	29	9	4

Patients showed improvement from mean score of 7 to 5.5 and 4.9 at 3 months and 6 months of follow up respectively.

Table 7: Functional grading by using Knee Society Score

KSS	Pretreatment(no. of Cases)	At 3 month	At 6 month
<50	38	11	9
50 -65	7	35	37
>65	3	4	4

The system is divided into a knee score that rates only the knee joint itself and a functional score that rates the patient's ability to walk and climb stairs. The Knee Society proposed that this new rating system is simple but more exacting and more objective. The rating is divided into knee and patient function scores. Advanced age or a medical condition will not affect the knee score.

Discussion

Females predominated our study; maximum patients were in age group of 40 to 60 years. Symptomatic left side knee OA predominated in our study. Maximum patients of our study had graded 1-2 (KL) OA. Platelet-rich plasma (PRP) is an autologous product that concentrates a large number of platelets in a small volume of plasma⁷. PRP functions as a fibrin tissue adhesive with hemostatic and tissue sealing properties, but it differs from fibrin glue and other platelet-poor tissue adhesives because its platelets provide a unique ability to promote wound healing and enhance osteogenesis and cartilage regeneration. PRP accelerates endothelial, epithelial, and soft tissue healing; decreases dermal scarring, enhances the hemostatic response to injury, and reverses the inhibition of wound healing caused by glucocorticoids. The high leukocyte concentration of PRP has an added antimicrobial effect⁸.

The concentration growth factors are 5 to 10 times higher than usual in PRP. To develop autologous PRP, about 16 -18ml of blood is drawn from the patient. This blood sample is placed in special tube and spinning in centrifuge for 15 minutes. This separates the whole blood into its components. Two spins are performed to remove RBCs and WBCs from the sample. The upper portion of the volume consists mostly of PPP (platelet-poor plasma) and is removed. Middle layer containing platelets is separated and their concentration is increased by centrifugation at the rate of 2500 rpm⁹.

Spakova et al used observed no severe adverse events were observed in their study. Statistically significant results in the WOMAC Osteoarthritis Index and Numeric Rating Scale scores were recorded in patients who received PRP injections after a 3 and 6 month follow-up¹⁰.

All previous studies reported short-term improvements in function and a decrease in pain

scores; however this effect did not appear to be sustained over a long period of time. The procedure appears to be safe, with the only adverse event reported being short-term pain following injection due to inflammation.

Conclusion

In early knee osteoarthritis injection of autologous PRP is safe, cost-effective and biocompatible but there is no evidence that a PRP injection alters the natural progression of OA. The results after treatment are encouraging with significant reduction in pain and improvement in knee function.

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