Effectiveness of the Platelet Rich Plasma in the Treatment of Early Osteoarthritis Knee: A Prospective Study

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Abstract: *Knee osteoarthritis is one of the leading causes of physical impairment and pain in the elderly. Symptomatic knee osteoarthritis is most common in people over the age of 60. It is a clinical condition characterized by joint inflammation and a multifactorial etiopathogenesis. The prevalence of OA in India is reported to be between 17 and 60.6%. The efficacy of platelet-rich plasma in knee osteoarthritis is currently being debated. his prospective study evaluates the efficacy of platelet rich plasma PRP injections in the treatment of early osteoarthritis of the knee. Thirty patients were treated and followed up over six months to assess pain reduction, stiffness decrease, and improvement in physical function using the WOMAC and VAS scales. Results indicated significant improvements in all measured outcomes, suggesting that PRP injections may serve as an effective, lowcost treatment option with minimal side effects for early knee osteoarthritis. Further randomized controlled trials are recommended to confirm these findings and establish PRP as a standard treatment.*

Keywords: Early osteoarthritis of knee, platelet rich plasma, PRP injection, Pain management, Physical function improvement

1. Introduction

Osteoarthritis (OA) is a clinically heterogeneous degenerative disorder defined by articular cartilage loss caused by a imbalance between Cartilage degeneration and regeneration.

Knee osteoarthritis is a leading source of physical impairment and discomfort In the elderly. Symptomatic knee osteoarthritis affects around 13% of adults over the Age of 60[1]. It is a clinical diagnosis of joint pain with a complex aetiology that is Characterised by a gradual loss of remodelling and joint inflammation.

Multiple Etiological factors that promote articular cartilage breakdown make OA a heterogenic disorder. Symptomatic OA of the knee, defined as pain on most Days of the month and radiologic evidence of arthritis, has a prevalence of 22% to 39% in India[2,3]. Osteoarthritis is a chronic disease of synovial lined joints in which Articular cartilage gradually weakens and disintegrates, resulting in new cartilage and Bone growth at the joint borders, cyst formation and sclerosis at subchondral bone Areas, mild synovitis, and capsular fibrosis.

Platelets are a natural source of growth factors, and platelet rich plasma (PRP) helps in articular cartilage repair. Growth factors promote chemotaxis, mesenchymal stem cell differentiation, chondrocyte proliferation, osseous and cartilaginous cell synthetic activity, and cartilage tissue remodelling[4]. PRP is a platelet-derived growth factor (GF)-rich autologous blood product That can be injected into injured areas to speed recovery[5]. PRP's autologous nature Supposedly minimises the danger of unwanted adverse effects, making it an Appropriate therapy choice[6,7].

The methods of administration range from direct injection into the knee to Treatment through a collagen membrane with a gel-like consistency[8]. Post-injection Discomfort, edoema, and activity limits have been observed in PRP injection Patients, and they resolve by the fourth day[9]. Platelets are the first to reach at the Site of tissue injury and, as a result, have the potential to release growth factors that Aid in the process of healing.

Platelets have three types of granules: lysosomal, dense, and alpha granules. TGF-, which includes platelet-derived growth factor (PDGF), insulin-like growth factor 1 (IGF-1), fibroblastic growth factor (FGF), and Epidermal growth factor (EGF); VEGF, platelet-derived epidermal growth factor (PDEGF), and cytokines and chemokines, which are involved in stimulating Chemotaxis, cell proliferation, and adhesion; and cytokines and chemokines, which are involved in stimulating[10]. Dopamine, histamine, serotonin, ADP, ATP, calcium ions, and other Neurotransmitters are stored in dense granules, which are crucial for tissue control and regeneration.

With our focus on the pathogenesis and progression of osteoarthritis and the Growing accessibility of cutting-edge biological therapies like platelet rich plasma, it is Necessary to evaluate the efficiency of these more recent treatment methods.

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Aims and Objectives

The purpose of the study is to evaluate the efficacy of Plate Rich Plasm (PRP) injections in treating early osteoarthritis of the knee and to assess its potential as a cost-effective, disease-modifying treatment option.

2. Materials and Methods

Inclusion Criteria:
- Kellgren- Lawrence Grade I, Grade II and Grade III A.
- Age more than 35 years.
- Patients who give consent for study.
- Platelet count more than 2 lakhs.

Exclusion Criteria:
- Secondary osteoarthritis.
- Coagulopathies.
- Active infection.
- Patient with underlying disease (e.g., Rheumatoid Arthritis and Gout)

Methodology:

A comprehensive medical history of the patient was obtained. A general Physical examination and a local examination of the afflicted knee were performed, As well as any necessary basic investigations. A plain antero-posterior and lateral Weight bearing radiograph of each knee was obtained. Kellegren-Lawrence grading Was performed using the radiographs.

PRP preparation:

The PRP extract will be made at Narayana Medical College using a double spin method, which produces an adequate concentration of platelets over baseline Levels that is 4 to 5 times the baseline concentration.

In a vacutainer, 20 ml of venous blood is mixed with an acid citrate phosphate dextrose solution while being carefully aseptically drawn from the cubital vein. A Centrifuge is then used to spin the sample for 15 minutes at 1200 rpm. Separate the Plasma from the vacutainer using a sterile needle and syringe, and then centrifuge it At 1500 rpm for 10 minutes to separate it further. A 18-gauge needle is used to inject 2 ml of this sample into the knee joint that is injured. The patient will receive one PRP injection.

Injection technique:

With the aid of a popliteal cushion, the patient is positioned supine with one knee slightly bent. Painted and draped knees. The superolateral approach infiltration Technique involves inserting the needle at an angle of roughly 45 degrees toward the Joint line until it reaches the space between the patella and the femur. Joint effusion, if any, was aspirated using a sterile syringe before 2 ml of PRP was injected into the joint. The injection site was covered with a sterile bandage. The patient is instructed to vigorously bend and extend their knee after 15 to 20 minutes of rest so that the PRP can diffuse throughout the joint region.

Post-injection protocol and follow-up:

After the injections, for the first two to three days, the patient will be instructed to apply cold therapy Three times daily for a total of 10 minutes each time. They will be permitted to take Acetaminophen up to a maximum dose of 2 grams per day or 300 mg of tramadol Per day for pain but not be allowed to take any other analgesics, NSAIDS, steroids, or drugs that affect platelet count or function. All of the participants will be evaluated using WOMAC, VAS, and IKDC scores At 1 month, 3 months, and 6 months after the course.

Blood is transferred into ACD tube.

Following condensation centrifugation at 1500rpm for 10 m

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Knee painted with betadine, wiped with sterile spirit swab and draped with hole towel.

Injection of PRP into the knee joint under aseptic precautions.
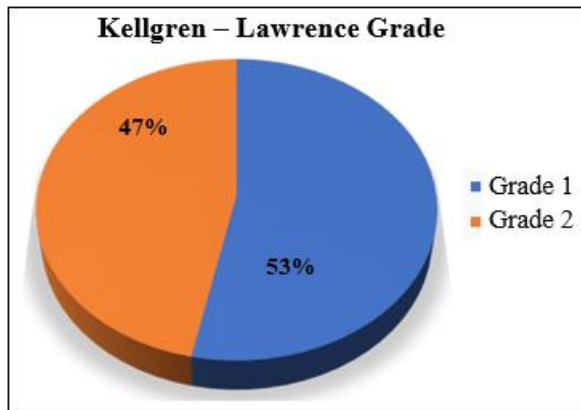
3. Results

The patients in prospective research with 30 participants were followed up at 1 month, 3 months, and 6 months after the course. There was no patient loss during follow-up. The study's findings were examined in terms of functional result in relation to age, sex, and osteoarthritis severity grades.

According to the survey, the majority of patients were between the ages of 61 and 70 (26.5%) and 41 and 50 (40%) years, the youngest patient was 41 years old and the eldest patient was 78 years old.

The male (48.5%) to female (51.5%) distribution was almost equal.

Among the 70 patients, 42 patients (60 %) had osteoarthritis of knee on right side and 28 patients (40%) on the left side.

As opposed to Kellgren- Lawrence Grade 1 (30%), Kellgren-Lawrence Grade 2 (70% of the study's subjects) was more prevalent.

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Distribution of Kellgren – Lawrence Grade.

Using 24 parameters, the WOMAC index is used to evaluate patients with hip or knee osteoarthrosis. It can be used to monitor the illness development or gauge how well a treatment is working.

Scale of difficulty	0 = None
	1 = Slight
	2 = Moderate
	3 = Very
	4 = Extremely

WOMAC score

WOMAC Score		Pre injection	1 Month	3 Months	6 Months
Platelet Rich Plasma	N	30	30	30	30
	Mean	70	59.8	50.7	37.2
	SD	3.5	6.3	8.7	10.9
P-value			0.001	0.0001	0.0001

WOMAC score
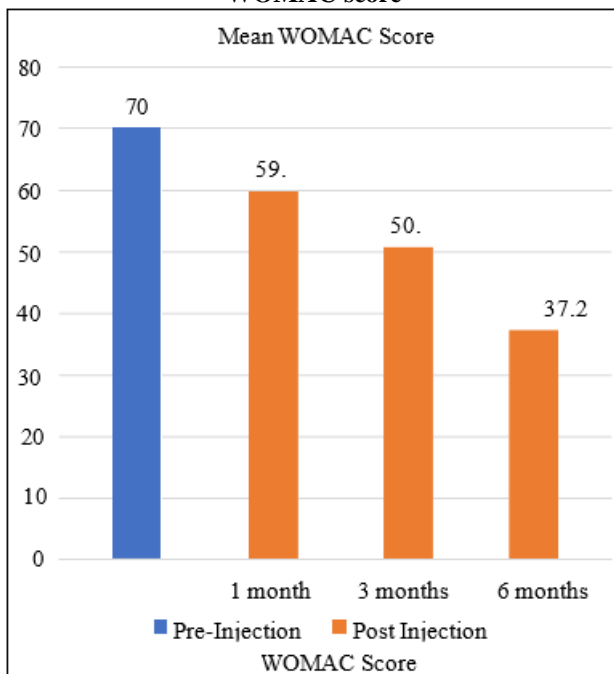
Pain Score

Pain Score		Pre injection	1 Month	3 Months	6 Months
Platelet Rich Plasma	N	30	30	30	30
	Mean	16.58	11.32	7.44	5.34
	SD	3.08	2.76	1.93	1.42
P-value			0.001	0.0001	0.0001

Stiffness Score

Stiffness Score		Pre injection	1 Month	3 months	6 Months
Platelet Rich Plasma	N	30	30	30	30
	Mean	5.50	4.60	3.78	3.40
	SD	1.22	1.20	1.09	1.14
P-value			0.0055	0.00003	0.00001

Physical Function Score

Physical Function Score		Pre injection	1 month	3 months	6 months
Platelet Rich Plasma	N	30	30	30	30
	Mean	52.12	46.5	36.4	24.6
	SD	3.77	4.53	6.49	6.33
P-value			0.00002	0.00001	0.00001

Visual Analog Score

Visual Analog Score		Pre injection	Post injection
Platelet Rich Plasma	N	30	30
	Mean	7.1	3.4
	SD	0.94	1.3
P-value		0.00001	0.00001

IKDC Score
With a mean pre-injection IKDC of 38.99, the patient's IKDC scores significantly improved, averaging 58.46 at two weeks, 61.57 at three months, and 63.86 at six months after the injection. (Table no.5)

	IKDC Pre injection	IKDC at 1 month	IKDC at 3 months	IKDC at 6 months
Mean	38.99	58.46	61.57	63.86
Median	39.65	58.9	61.7	63.9
Standard deviation	3.43	3.20	2.92	3.26
P-value		0.00001	0.00001	0.00001

IKDC score
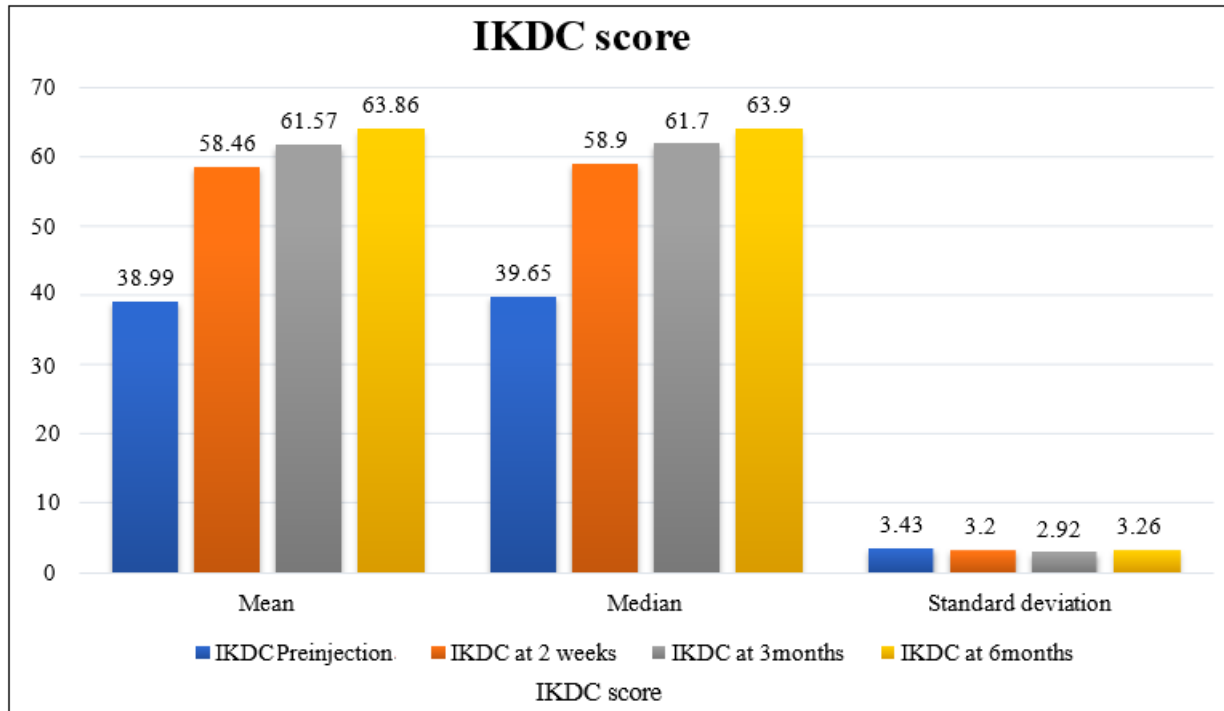
4. Discussion

Osteoarthritis is the most prevalent form of degenerative arthritis, affecting the elderly and causing physical, emotional, and social distress. Osteoarthritis most typically affects the knee and is more common in elderly women.

In the past, many therapy techniques were employed to reduce pain and enhance joint function. Physiotherapy, lifestyle changes such as weight loss and Activity reductions, and pharmaceutical therapy such as oral opioids, NSAIDs, Chondroitin supplements, glucosamine, and intraarticular injections of steroids and Hyaluronic acid were among them. Surgical options included arthroscopic lavage, Debridement in situations of loose bodies, osteotomies, and complete knee replacement, which is the ultimate resort when all medical treatments have failed and patients are suffering from intractable pain and impairment.

Corticosteroids, hyaluronic acid, visco supplementation, and autologous Platelet Rich plasma are examples of intra-articular injectables. Intra articular Autologous platelet-rich plasma, which has a high concentration of growth factors And is a promising treatment for osteoarthritis of the knee, also helps patients with Their pain levels and disease-limiting activities. The ability to lower the overall cost of The healthcare system is provided by this treatment method.

Physicians are focusing more and more on therapeutic approaches that can both stop the progression of disease and restore tissues that have been harmed. The intraarticular autologous platelet rich plasma injection was a choice that was offered; this option is recent and provides patients with more pronounced relief.74 To Investigate the effectiveness of autologous intra-articular platelet rich plasma injection in osteoarthritis of the knee and its functional result in patients with early osteoarthritis of the knee, we decided to conduct this study in light of this.

When using PRP, we injected 2 ml of freshly made PRP. As different writers Employed diverse PRP injection strategies. Using two injections of 5 ml each spaced By 4 weeks, Filardo et al. 4 injections of 5.5 ml each were given at intervals of 1 Week by Cerza et al. Kon et al used 3 injections of 5 ml each spaced by 2 weeks. Spakova et al. administered 3 injections with a volume of 3 ml, spaced 1 week apart.

In our study, participants were split into four groups based on their ages: group one, 41–50 years, group two, 51–60 years, group three, 61–70 years, and group four, more than 70 years. At the 6-month follow-up, all clusters displayed a Significant rise in IKDC scores

We, in our study, had 30 patients with classic findings of early osteoarthritis. They were comparable to baseline characteristics of age, gender, pre-injection, and post injection WOMAC score and Visual Analog Score. All the patients received Intraarticular injections

The efficacy of Platelet Rich Plasma (PRP) in decreasing pain, stiffness, physical function was assessed and scored on the WOMAC and Visual Analog Score. Age distribution revealed a mean age in to be 54.91%. Gender distributions were comparable in both groups, with 43.3 % being male 56.7% being female

In this study of platelet-rich plasma ensured that all patients were comparable to baseline. The Global WOMAC score showed a mean of 70% at the pre-injection period, which decreased to 59.8% at 1 month follow up and 50.7% at 3 months and declining to 37.2 at 6 months.

The study showed a significant decrease in the global WOMAC score, which Was also consistent throughout the study period. Individual variables such as pain, physical function, etc. were assessed. The mean score for pain 16.58% at the pre-injection period, which decreased to 11.32% at 1 month follow up and 7.44% at 3 months and declining to

5.34% at 6 months.

The mean of physical function decreased from a pre-injection score of 53.12% at the pre-injection period, which decreased to 46.5% at 1 month follow up And 36.4% at 3 months and declining to 24.6% at 6 months.The mean of Visual Analog Score at the pre-injection period was 7.4% and 3.4% at post-injection period. With a mean pre-injection IKDC of 38.99, the patient's IKDC scores significantly improved, averaging 58.46 at two weeks, 61.57 at three months, and 63.86 at six months after the injection.

5. Conclusion

This study demonstrates that plateletrich plasma PRP injections are effective in reducing pain, stiffness, and improving physical function in patients with early osteoarthritis of the knee. These findings suggest that PRP could be a valuable treatment option, potentially delaying the need for surgical intervention. However, further largescale, randomized controlled trials are necessary to validate these results and determine the longterm benefits and risks associated with PRP treatment for knee osteoarthritis.

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