

Original article

Platelet Rich Plasma Versus Corticosteroid Injections in Treatment of Knee Osteoarthritis

Zeyad Buahlaika, Ahmad Saad*^{ID}, Sanad Younes

Department of Orthopedics surgery, Faculty of Medicine, Omar Al-Mukhtar University, Albayda, Libya

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Corresponding Email. ahmad.e.saad@omu.edu.ly

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ABSTRACT

This study seeks to assess and compare the impact and functional outcomes of platelet-rich plasma and corticosteroid injections in individuals with knee osteoarthritis. In this prospective study, sixty randomly selected patients diagnosed with mild to moderate knee osteoarthritis were included. The patients underwent treatment with either platelet-rich plasma or corticosteroid injection. The assessment of patients was conducted during a follow-up period ranging from six months to one year, utilizing the visual analog scale and the Knee Injury and Osteoarthritis Outcome Score. Written informed consent was obtained from each participant included in the study. This study revealed that patients treated with PRP injections demonstrated favorable outcomes, including an improved range of motion and earlier return to activity, when compared to those treated with corticosteroid injections. Based on clinical scoring using the Knee Injury and Osteoarthritis Outcome Score (KOOS), the mean result for PRP injection recipients was 83.5, whereas for corticosteroid injection recipients, it was 61.8. While both PRP and intra-articular corticosteroid injections prove effective in alleviating pain and enhancing activities of daily living, this study highlights that patient receiving PRP injections exhibited superior outcomes. Specifically, they experienced better pain relief, improved range of motion, and a quicker return to activity compared to those treated with corticosteroid injections.

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INTRODUCTION

Osteoarthritis stands out as the predominant joint ailment leading to pain and disability among older adults. Among its various manifestations, knee osteoarthritis exhibits a higher incidence compared to hip or hand osteoarthritis. The primary symptoms in individuals with knee osteoarthritis include pain, accompanied by stiffness and restricted mobility of the knee [1]. Knee osteoarthritis stands as the most prevalent form of arthritis in the lower extremities, comprising 23% of all arthritis cases, according to Moretti [2]. Factors such as advanced age, female gender, overweight and obesity, knee injury, bone density, muscle weakness, and joint laxity have been identified as contributors to the progression of arthritis [3,4]. About 13% of females and 10% of males aged above 60 years have symptomatic knee arthritis [5]. Discomfort arising from knee or hip arthritis often results in reduced physical activity. The primary objective of treatment is to alleviate pain, mitigate the decline in physical function, and subsequently impede the progression of the disease, ultimately enhancing the individual's quality of life [6-10].

In individuals showing inadequate responsiveness to oral medications, intra-articular injections can serve as an alternative treatment [11]. Synovial inflammation is likely a significant contributor to pain in osteoarthritis patients. Consequently, intra-articular administration of topical anti-inflammatory therapies has proven effective in alleviating pain [12].

Corticosteroids exert both anti-inflammatory and immunosuppressive effects, with their mechanism of action being intricate [13]. These medications decrease vascular permeability, hinder the accumulation of inflammatory cells, impede phagocytosis, suppress the production of superoxide in neutrophils, and block the synthesis and release of inflammatory mediators like prostaglandins and leukotrienes [14]. The anti-inflammatory properties of these medications diminish erythema, swelling, warmth, and tenderness in inflamed joints. Additionally, they enhance viscosity by elevating the concentration of hyaluronic acid [15]. This study seeks to assess and compare the impact and functional outcomes of platelet-rich plasma and corticosteroid injections in individuals with knee osteoarthritis.

METHODS

Study design and setting

From January 2020 to October 2021, this study included sixty randomly selected patients who presented at Althawra Hospital – Albayda with mild to moderate osteoarthritis of the knee joint. Thirty patients underwent treatment with platelet-rich plasma, while the remaining thirty received 2 ml Betamethasone dipropionate corticosteroid. Each patient participated in a follow-up period lasting at least one year.

Inclusion criteria

Encompassed individuals aged 45 to 75 years diagnosed with grades 2 to 3 knee osteoarthritis (OA).

Exclusion criteria

Comprised those with deformities, cancer, rheumatoid lesions, a body mass index (BMI) exceeding 35 kg/m², and acute infections.

Methods of treatment

A total of 30 patients underwent treatment with intra-articular PRP injections, while another group of 30 patients received corticosteroids. A comprehensive assessment, including history and clinical examination, was conducted for each participant in this study. Complete blood count analysis was performed to rule out anemia and thrombocytopenia. All radiographs were taken with patients under weight-bearing conditions. Pain evaluation post-treatment was quantified using the Visual Analog Scale (VAS). Additionally, outcomes were assessed utilizing the Knee Injury and Osteoarthritis Outcome Score (KOOS) at intervals of 0, 1, 3, and 6 months during the follow-up period.

Platelets rich plasma preparation

The patient's blood was collected and placed in a PRP tube containing 0.2 ml of 3.2% sodium citrate. Subsequently, the blood underwent separation into platelet-poor plasma and platelet-rich plasma. The platelet-rich plasma was then subjected to a second centrifugation for 7 minutes at 2,300 RPM. The resulting platelet concentrate demonstrated an approximate 2–4 times higher concentration of platelets compared to the baseline whole blood. The entire process, from blood draw to injection in patients, took approximately 30 minutes.

Injection technique

Patients were positioned in a supine posture, and the knee skin was sanitized using a 10% antiseptic betadine solution. PRP was administered through either the anteromedial or anterolateral approach of the knee, followed by the application of a bandage over the injection site. After a 15-minute period of rest and observation, patients were instructed to actively flex and extend their knees, facilitating the spread of PRP across the joint space before its gel formation. Subsequently, the patients were discharged. The identical procedures were replicated for the group of patients receiving steroid injections.

Corticosteroid preparation:

- 2 ml Betamethasone Dipropionate Ampule.

Post-injection protocol

Abstain from bearing weight for three days and refrain from engaging in running and other high-impact activities for a minimum of seven days. It is noteworthy that PRP effectively triggers an inflammatory response. For optimal analgesic relief, take a 500mg acetaminophen tablet twice daily for a duration of five days. Avoid using aspirin or any steroids, as they possess antiplatelet and anticoagulant effects that may compromise the efficacy of PRP.

Methods of assessment of results

Knee injury and Osteoarthritis Outcome Score (KOOS) at 0,1, 3, and 6 months after treatment [16].

RESULTS

At the end of the follow-up period, patients were evaluated using a clinical scoring system, including the Visual Analog Scale (VAS) and the Knee Injury and Osteoarthritis Outcome Score (KOOS). The findings revealed a mean score of 83.5 for PRP injection, contrasting with 61.8 for corticosteroid injection (Table 1).

Table 1. Comparison between two studied groups according to score

Score after	PRP (n = 30)		Corticosteroid (n = 30)		Test of sig.	P
	No.	%	No.	%		
Poor	4	13.3	18	60.0	$\chi^2=15.056^*$	$MC_p= 0.001^*$
Fair	2	6.7	4	13.3		
Good	9	30.0	3	10.0		
Excellent	15	50.0	5	16.7		
Min. – Max.	15.0 – 100.0		15.0 – 100.0		Z= 4.021*	<0.001*
Mean ± SD	83.50 ± 18.72		61.83 ± 21.15			
Median	87.50		60.0			

χ^2 : value for Chi square, MC: Monte Carlo test

At the end of the follow-up period, patients underwent an assessment specifically focused on pain in the affected knees. The outcomes were documented and organized in table 1.

Table 2. Comparison between two studied groups according to pain

Pain	PRP (n = 30)		Corticosteroid (n = 30)		χ^2	MC_p
	No.	%	No.	%		
None	10	33.3	5	16.7	16.253*	0.001*
Mild	16	53.3	6	20.0		
Moderate	3	10.0	16	53.3		
Sever	1	3.3	3	10.0		

At the end of the follow up period, patients were assessed regarding to the limitation of activity. Results were tabulated in table 3.

Table 3. Comparison between two studied groups according to limitation of activity

Limitation of activity	PRP (n = 30)		Corticosteroid (n = 30)		χ^2	MC_p
	No.	%	No.	%		
None	22	73.3	3	10.0	25.850*	<0.001*
Minor	7	23.3	22	73.3		
Major	1	3.3	5	16.7		

A statistically significant association was observed between body mass index and the final score in the PRP group, whereas in the corticosteroid group, no significant relationship was identified (Table 4). Within the PRP group, the mean body mass index for satisfactory results was 25.7, whereas for unsatisfactory results, it was 30.4.

Table 4. Relation between assessments with body mass index in each group

Body mass index	PRP		Corticosteroid	
	Unsatisfactory (n = 6)	Satisfactory (n = 24)	Unsatisfactory (n = 22)	Satisfactory (n = 8)
Min. – Max.	26.60 – 35.10	19.50 – 34.0	20.80 – 33.30	21.10 – 33.30
Mean ± SD	30.42 ± 2.91	25.70 ± 3.65	27.11 ± 3.44	26.50 ± 4.34
Median	29.80	25.40	27.55	24.90
T	2.926*		0.401	
P	0.007*		0.692	

Among the sixty knees, 36 belonged to females (60%) and 24 to males (40%). In the female subgroup, 18 received PRP injections, while another 18 received corticosteroid injections. Within the male subgroup, 12 underwent PRP injections, and an additional 12 were treated with corticosteroid injections. The right side was affected in 32 patients (53%), with 12 receiving PRP injections and 20 receiving corticosteroid injections. On the left side, which was involved in 28 patients (47%), 18 were treated with PRP injections, and 10 underwent corticosteroid injections.

Among the patient demographics, office workers comprised 42%, manual workers constituted 27%, housewives accounted for 23%, and students made up 8%.

DISCUSSION

Osteoarthritis is a persistent condition characterized by the gradual deterioration of joints and the loss of cartilage on joint surfaces. Knee osteoarthritis is prevalent in around 11% of women and 7% of men aged 60 years or older [17]. This study included sixty randomized cases, with 30 receiving PRP injections and the remaining 30 receiving corticosteroid injections, all observed over a one-year follow-up period. The objective was to assess the function and clinical outcomes of platelet-rich plasma (PRP) and corticosteroid injections in the treatment of knee osteoarthritis. The findings revealed that patients treated with PRP injections experienced excellent results, including significant pain relief, improved range of motion, and an earlier return to normal activities compared to those treated with corticosteroid injections. Notably, some individuals exhibited notable improvement with just one PRP injection, while others benefited from multiple injections, in contrast to the relatively short-lived effects observed with a single corticosteroid injection.

The mean clinical result for patients treated with PRP injections was 83.5, whereas for those treated with corticosteroid injections, it was 61.8. Statistical analyses demonstrated significant differences between the groups across the majority of outcome variables, with the PRP group showing a greater degree of improvement.

Filardo et al. [18] conducted a study involving three consecutive intra-articular PRP infiltrations in a group of 91 patients with chronic degenerative knee conditions. Improvement in the IKDC and EQ-VAS indexes was observed up to 1 year, but this improvement deteriorated 24 months after the initial clinical gains, especially among younger patients with a low to mild degree of cartilage degeneration. Similarly, Fukawa et al. [19] performed three consecutive PRP injections, noting a reduction in VAS scores up to 1 year, followed by a decline in the observed improvement after 24 months. Notably, a single intra-articular injection of PRP in their study resulted in significant pain relief for up to 12 months, with the maximum pain decrease occurring after 3 months, suggesting a critical role for the number of PRP injections in sustaining beneficial effects. On the other hand, Patel et al. [20] found no significant differences between single and double PRP injections for early osteoarthritis at 6 weeks, 3 months, and 6 months.

Most published studies on the effectiveness of PRP for osteoarthritis are series studies, typically with patients under the age of 60 and in early-stage OA [21]. This aligns with our study, where most cases showed good improvement, especially in individuals under 60 years old.

Some studies comparing PRP with hyaluronic acid at a 6-month follow-up reported superior results in the PRP group, especially for younger patients, male individuals, and those with early-stage arthritis [22].

The administration of corticosteroids for treating osteoarthritis has been controversial. While these injections may reduce pain in the short term, they may not effectively treat the underlying arthritic lesion [13]. Corticosteroid administrations have been associated with deleterious effects on musculoskeletal tissues, including the reduction of collagen synthesis, suppression of cell proliferation, induction of oxidative stress, and impact on cell viability [23]. These harmful effects could contribute to the observed differences in long-term results between treatment groups receiving corticosteroids [24] [25] [26].

CONCLUSION

This study underscores the significance of consecutive platelet-rich plasma (PRP) injections, exceeding two to three sessions, as an effective intervention for mild to moderate knee osteoarthritis. Our findings suggest superior outcomes with PRP injections compared to corticosteroids. Notably, the sustained benefits observed in patients receiving multiple PRP injections highlight the potential of this therapeutic approach in managing knee osteoarthritis. This conclusion contributes valuable insights to the existing literature, emphasizing the positive impact of a series of PRP injections for sustained improvements in knee osteoarthritis. Further research and clinical trials are warranted to validate and extend these findings, ultimately informing optimal treatment strategies for individuals with knee osteoarthritis.

Conflicts of Interest

The authors declare no conflicts of interest.

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حقن البلازما الغنية بالصفائح الدموية مقابل حقن الكورتيكوستيرويد في علاج هشاشة العظام في الركبة

زياد بوحليقة، أحمد سعد*، سند يونس

قسم جراحة العظام، كلية الطب، جامعة عمر المختار، البيضاء، ليبيا

المستخلص

تسعى هذه الدراسة إلى تقييم ومقارنة التأثيرات والنتائج الوظيفية لحقن البلازما الغنية بالصفائح الدموية وحقن الكورتيكوستيرويد لدى الأفراد المصابين بالتهاب مفاصل الركبة. في هذه الدراسة الاستباقية، تم اختيار ستين مريضاً بشكل عشوائي تم تشخيصهم بخشونة مفاصل الركبة الخفيف إلى المتوسط. خضع المرضى للعلاج إما بحقن البلازما الغنية بالصفائح الدموية أو حقن الكورتيكوستيرويد. تم تقييم المرضى خلال فترة متابعة تتراوح بين ستة أشهر وسنة باستخدام مقياس التناظر البصري ودرجة إصابة الركبة ونتائج خشونة المفاصل العظمية. أظهرت هذه الدراسة أن المرضى الذين عولجوا بحقن البلازما الغنية بالصفائح الدموية أظهروا نتائج إيجابية، بما في ذلك تحسن في نطاق الحركة والعودة المبكرة إلى النشاط مقارنةً بالمرضى الذين عولجوا بحقن الكورتيكوستيرويد. بناءً على التقييم السريري باستخدام درجة إصابة الركبة ونتائج التهاب المفاصل العظمي، كان متوسط النتيجة لمتلقي حقن البلازما الغنية بالصفائح الدموية 83.5، في حين كان 61.8 لمتلقي حقن الكورتيكوستيرويد. في حين أن كلا من حقن البلازما الغنية بالصفائح الدموية وحقن الكورتيكوستيرويد داخل المفصل أثبتت فعاليتها في تخفيف الألم وتحسين الأنشطة اليومية، تسلط هذه الدراسة الضوء على أن المرضى الذين تلقوا حقن البلازما الغنية بالصفائح الدموية أظهروا نتائج متفوقة. بشكل خاص، شعروا بتخفيف أكبر للألم، وتحسن في نطاق الحركة، وعودة أسرع إلى النشاط مقارنةً بالمرضى الذين عولجوا بحقن الكورتيكوستيرويد.

الكلمات المفتاحية: الركبة، هشاشة العظام، البلازما الغنية بالصفائح الدموية، حقن الكورتيكوستيرويد.