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CASE REPORT

Intra-Articular Platelet-Rich Plasma for Chondromalacia Patellae in a Young Active Patient: A Case Report

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Abstract

Chondromalacia patellae (CMP) is a common cause of anterior knee pain in young and physically active individuals. Conservative management, including activity modification, physiotherapy, quadriceps strengthening and analgesic medication, remains the initial treatment. Persistent symptoms despite appropriate conservative care may require additional interventions. Platelet-rich plasma (PRP) has attracted interest as a biological treatment because of its potential anti-inflammatory and tissue-modulating effects.

We report the case of a 25-year-old athletic trainee with more than two years of left anterior knee pain aggravated by stair climbing, squatting and prolonged sitting. Examination demonstrated a positive patellar grind test, localized superior patellar tenderness and mild quadriceps wasting without instability or clinically significant effusion. MRI showed thinning of the patellar cartilage consistent with chondromalacia patellae with minimal effusion. After inadequate sustained response to conservative treatment, three intra-articular injections of leukocyte-poor PRP were administered at approximately four-week intervals. For each session, 22 mL of autologous blood was collected using acid citrate dextrose solution A (ACD-A) and processed with two Precurcell PRP kits using a single-spin centrifugation protocol at 4000 rpm for 15 minutes. 5 mL of PRP was injected intra-articularly at each session. Baseline platelet count was 1.8 lakh/µL; platelet concentration and leukocyte count in the final PRP product were not measured. Visual Analogue Scale (VAS) pain score decreased from 50 at baseline to 30 after the first injection and 20 after the second and third injections. The patient experienced increased pain for approximately 6–7 days after the first injection. Gradual stretching and quadriceps strengthening were initiated one week after the first injection. The patient was followed telephonically for six months after the first injection. At final follow-up in December 2025, approximately four months after the third injection, he reported comfortable routine work and daily activities and was able to walk and jog comfortably.

This case illustrates the potential role of a standardized, leukocyte-poor PRP treatment protocol as an adjunct to rehabilitation in a young patient with persistent CMP. However, absence of post-treatment MRI, quantitative PRP characterization and validated functional outcome measures limits interpretation of structural and functional effects.

Keywords

Chondromalacia patellae, platelet-rich plasma, anterior knee pain, patellofemoral pain, regenerative medicine, leukocyte-poor PRP

Introduction

Chondromalacia patellae is a frequently encountered cause of anterior knee pain, particularly in young and physically active individuals. It refers to structural changes involving the articular cartilage of the patella and is commonly associated with pain during activities that increase patellofemoral joint loading, including stair climbing, squatting, running and prolonged sitting.[1,2]

Management is generally stepwise. Conservative treatment remains the foundation and includes activity modification, physiotherapy, quadriceps strengthening, correction of lower-limb biomechanics and appropriate analgesia. Many patients improve with rehabilitation, but some continue to experience pain and functional limitation despite an adequate trial of conservative treatment. In selected patients, minimally invasive interventions may be considered.

PRP is an autologous blood-derived preparation containing concentrated platelets and associated bioactive mediators. Platelets release growth factors and cytokines, including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β) and vascular endothelial growth factor (VEGF), which may influence inflammation, tissue remodeling and local biological responses.[3,7,8] PRP has therefore been investigated in several musculoskeletal conditions, including cartilage disorders and patellofemoral pathology.[5,6]

However, PRP is not a uniform biological product. Preparation systems, centrifugation protocols, platelet concentration, leukocyte content, injection volume, number of injections and treatment intervals vary considerably between studies.[4-6] Consequently, there is no universally accepted PRP protocol for chondromalacia patellae. The present case describes the clinical course of a young active patient with persistent CMP treated with three intra-articular injections of leukocyte-poor PRP using a defined preparation protocol, followed by rehabilitation.

Case Presentation

A 25-year-old male athletic trainee presented with left anterior knee pain of more than two years duration. At presentation, pain intensity was 50. Symptoms were particularly aggravated by climbing stairs, squatting and prolonged sitting. There was no history of trauma. The patient had previously received conservative treatment, including physiotherapy and oral analgesic medication, with only temporary relief.

On examination, the patellar grind test was positive, with localized tenderness over the superior aspect of the patella. Mild quadriceps wasting was noted. There was no clinically apparent joint effusion and no evidence of knee instability.

MRI of the left knee demonstrated chondromalacia patellae with thinning of the patellar cartilage. Minimal effusion was noted in the medial and lateral compartments and the patellofemoral joint. In view of the chronic symptoms, functional limitation, imaging findings and inadequate sustained response to conservative treatment, intra-articular PRP was offered as a minimally invasive treatment option.

After informed consent, the procedure was performed under strict aseptic precautions with basic monitoring. 22 mL of autologous venous blood was withdrawn from the antecubital vein using a 21-gauge needle and collected with acid citrate dextrose solution A (ACD-A) as anticoagulant. PRP was prepared using two Precurcell PRP kits according to the institutional protocol. A single-spin

centrifugation technique was used at 4000 rpm for 15 minutes. Following centrifugation, the plasma fraction was separated from the erythrocyte layer, with incorporation of the platelet-containing plasma/buffy-coat fraction according to the preparation protocol. A leukocyte-poor PRP preparation was obtained. 5 mL of PRP was injected intra-articularly into the left knee using an aseptic technique. The same preparation protocol and injection volume were used for all three sessions.

The patient's baseline platelet count was 1.8 lakh/µL. Platelet concentration and leukocyte count in the final PRP product were not measured.

The first PRP injection was administered in June 2025. Two further injections were administered approximately four weeks apart, in July and August 2025. Following the first injection, the patient reported increased knee pain for approximately 6–7 days, after which improvement became apparent. VAS pain decreased from 50 at baseline to 30 after the first injection, 20 after the second injection and remained 20 after the third injection.

For post-procedure pain, oral tramadol 37.5 mg/paracetamol 325 mg (Ultracet) was prescribed twice daily initially, followed by use as required. After the first injection, the patient used Ultracet twice daily for four days, once daily for the following three days and subsequently only as required. After the second and third injections, it was used only as required.

Gradual stretching and quadriceps-strengthening exercises were initiated one week after the first PRP injection and continued thereafter. The patient was followed telephonically for six months after the first injection. At final telephone follow-up in December 2025, approximately four months after the third injection, he reported being comfortable, performing routine work and daily activities normally without compromising his usual habits, and being able to walk and jog comfortably. He continued the prescribed rehabilitation exercises.

A validated patellofemoral-specific functional outcome score was not prospectively recorded, and post-treatment MRI was not performed.

Discussion

Chondromalacia patellae represents a spectrum of patellofemoral cartilage pathology and is an important cause of anterior knee pain in young individuals. Symptoms are typically provoked by activities that increase compressive and shear forces across the patellofemoral joint. In the present case, the clinical pattern, positive patellar grind test, localized patellar tenderness and MRI evidence of patellar cartilage thinning supported the diagnosis. The absence of instability or significant effusion and the absence of trauma were also consistent with the presentation.

Conservative management remains the cornerstone of treatment. Physiotherapy directed towards quadriceps strengthening and restoration of lower-limb mechanics can improve patellofemoral function and reduce symptoms. Activity modification and appropriate analgesia may provide additional symptomatic benefit. The patient in this report had persistent symptoms for more than two years despite previous physiotherapy and oral analgesics, with only temporary relief. This provided the clinical context for considering a minimally invasive intervention.

PRP has been proposed as a biological treatment because platelets release multiple mediators involved in cellular signaling, inflammatory modulation and tissue remodeling. PDGF, TGF-β and VEGF are among the mediators released following platelet activation.[3-8] Nevertheless, the biological mechanisms responsible for clinical improvement in CMP remain incompletely defined. Importantly, symptomatic improvement should not be equated with structural cartilage regeneration. Published studies have explored PRP in chondromalacia patellae and related

patellofemoral disorders. Orscelik and colleagues reported PRP and prolotherapy in chondromalacia patella treatment.[3] More recent systematic reviews have evaluated PRP in patellofemoral arthritis, chondromalacia patellae and anterior knee pain. Chalidis et al. reviewed five studies involving 146 patients and reported improvement in several clinical outcomes, while emphasizing that radiological evidence of cartilage regeneration remains limited and uncertain.[7] A systematic review of medical interventions for patellofemoral pain and patellofemoral osteoarthritis reported very low-certainty evidence for PRP, emphasizing the need for better comparative studies.[4] A 2026 systematic review of orthobiologic therapies also reported generally favorable clinical trends while highlighting the limited and heterogeneous evidence base.[8]

An important issue in PRP research is the absence of a universally standardized preparation. Centrifugation technique and processing system can alter platelet and leukocyte concentrations, making direct comparison between studies difficult.[4-6] In the present case, two Precurcell PRP kits were used with a defined single-spin protocol of 4000 rpm for 15 minutes. 22 mL of blood was collected with ACD-A, and 5 mL of leukocyte-poor PRP was injected at each session. The use of the same preparation protocol for all three injections improves procedural consistency within the case. However, because the final platelet concentration and quantitative leukocyte count were not measured, the cellular composition of the final product cannot be precisely characterized. The baseline platelet count was 1.8 lakh/µL, but this cannot be used to calculate the platelet concentration of the PRP product.

Recent evidence further supports the clinical relevance of repeated PRP administration while also highlighting the limitations of extrapolating evidence from knee osteoarthritis to isolated chondromalacia patellae. Alhamam et al. reported six-month outcomes in 103 patients with patellofemoral chondromalacia treated with PRP, demonstrating significant reductions in VAS pain and improvements in the Anterior Knee Pain Scale. Importantly, the study found no change in Outerbridge grade over six months, despite symptomatic and functional improvement.[6] This finding is particularly relevant to the present case: the patient similarly demonstrated sustained symptomatic and functional improvement during follow-up, but no post-treatment MRI was performed. Thus, our clinical improvement should be interpreted as symptomatic and functional rather than evidence of structural cartilage regeneration.

The patient received three injections at approximately four-week intervals. Published literature has used different numbers and intervals of injections, and one randomized trial cited in previous reviews reported greater improvement with three injections compared with a single injection.[4] The present treatment schedule was therefore consistent with previously reported repeated-injection approaches, although it should not be interpreted as an established standard protocol. The available evidence remains insufficient to determine the optimal number, interval or volume of PRP injections for CMP.

The choice of a three-injection regimen is also supported indirectly by evidence from knee osteoarthritis. Yurtbay et al. conducted a randomized, double-blind, placebo-controlled trial of 237 patients and found that multiple PRP injections produced better clinical scores than single-dose PRP at selected follow-up points, including 6 and 12 months.[5] A meta-analysis of single versus multiple PRP injections similarly reported a functional advantage for multiple injections, particularly three-injection protocols, although pain outcomes were not consistently superior and the authors emphasized that the evidence remained insufficient. Because these studies involved knee osteoarthritis rather than isolated chondromalacia patellae, they should not be considered direct evidence that three injections are superior for CMP. In the present case, they provide contextual support for the repeated-injection approach rather than a definitive dosing recommendation.

The clinical response in this case was characterized by an early period of increased pain followed by progressive improvement. VAS decreased from 50 at baseline to 30 after the first injection and 20 after the second and third injections. The patient also reported meaningful improvement in daily function and was comfortable walking and jogging at final follow-up. Rehabilitation was an important component of management, with gradual stretching and quadriceps strengthening initiated one week after the first injection. Thus, PRP should be viewed in this case as part of a broader treatment strategy rather than as a replacement for rehabilitation.

Post-injection analgesia is another potential confounder when interpreting symptomatic response. The patient used Ultracet for a limited period after the first injection and only as required after subsequent injections. Therefore, although analgesic use may have influenced early pain reporting, the sustained functional improvement at later follow-up occurred in the context of ongoing rehabilitation and limited rescue analgesic use.

Limitations

This case has some limitations. First, the final PRP platelet concentration and leukocyte count were not measured. Although the preparation was classified as leukocyte-poor, its precise cellular composition cannot be retrospectively quantified. Second, a validated patellofemoral-specific functional outcome measure, such as the Kujala Anterior Knee Pain Scale, was not prospectively recorded. Outcome assessment relied solely on the VAS for pain, and no validated functional or patient-reported outcome instrument specific to patellofemoral pain was used, which limits interpretation of functional outcomes. Functional improvement was therefore based on clinical assessment and patient-reported activity. Third, post-treatment MRI was not performed; consequently, structural changes in patellar cartilage cannot be assessed and no claim of cartilage regeneration can be made. Finally, although telephone follow-up extended to six months after the first injection, the final assessment was remote rather than an in-person examination.

The strengths of the case include detailed documentation of the PRP preparation protocol, consistency of the preparation across three injections, serial VAS measurements and longer-term patient-reported functional follow-up. The case should be interpreted as a clinical observation rather than evidence of efficacy or cartilage regeneration. Future prospective studies should incorporate standardized PRP characterization, validated functional measures, appropriate comparator groups, objective imaging when structural outcomes are being investigated and longer follow-up.

Conclusion

This case describes symptomatic and functional improvement following three intra-articular injections of leukocyte-poor PRP in a young, active patient with persistent chondromalacia patellae despite conservative treatment. 22 mL of autologous blood was processed using two Precurcell PRP kits with ACD-A and a single-spin centrifugation protocol at 4000 rpm for 15 minutes, producing 5 mL of leukocyte-poor PRP for each injection. VAS pain decreased from 50 at baseline to 30 after the first injection and 20 after the second and third injections, with the patient reporting comfortable performance of routine activities and work and the ability to walk and jog at final follow-up.

However, the absence of quantitative platelet and leukocyte measurements, a validated functional outcome score and post-treatment MRI limits interpretation of the biological, structural and functional effects of treatment. The clinical improvement should therefore not be interpreted as evidence of cartilage regeneration. Larger controlled studies with standardized

PRP characterization, validated outcomes and appropriate imaging-based assessment are required to establish the efficacy, optimal preparation and dosing protocol of PRP for chondromalacia patellae.

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Declarations

Ethics Approval

Institutional ethics approval was not required because the case was considered exempt under the institutional policy of Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS).

Consent for Publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying clinical information and images. The patient was informed that identifying information would not be disclosed.

Conflict of Interest

The authors declare that they have no conflict of interest related to this case report.

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Author Contributions

Dr Abhishek Raj Singh contributed to the clinical management of the patient, collection and interpretation of clinical information, literature review, and preparation of the manuscript. Dr Sujeet Gautam contributed to clinical supervision, review of the case, interpretation of the clinical information, and critical revision of the manuscript. Both authors approved the final manuscript and agree to be accountable for the work.