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Platelet-rich Plasma for Traumatic Knee Osteoarthritis with Medial Condyle Fracture, Meniscal Damage and Ligament Sprain

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ABSTRACT

Background: Knee osteoarthritis (OA) is a leading cause of musculoskeletal disability worldwide. Early-stage disease, particularly when associated with traumatic structural injuries, presents a complex management challenge. Platelet-rich plasma (PRP) has emerged as an adjunct biological therapy for early OA, with evidence suggesting potential benefits in pain reduction and functional improvement. **Case Description:** A 39-year-old male with a one-year history of bilateral knee pain presented following an acute twisting injury. Radiographic and MRI evaluation revealed Kellgren–Lawrence Grade 2 bilateral knee OA, a right medial femoral condyle subchondral fracture, left lateral meniscal degeneration, bilateral cruciate ligament sprain, and Grade 3 chondromalacia patella. **Intervention:** The patient underwent 3 sessions of image-guided intra-articular leukocyte-poor PRP injections in both knees, along with targeted periarticular leukocyte-rich PRP administration to involved structures, combined with viscosupplementation and a structured physiotherapy programme. **Outcome:** Visual analogue scale (VAS) scores improved from 9 at baseline to 2 at 12 weeks. Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores (0–100 scale) decreased from 72 to 32 over the same period, indicating clinically meaningful functional improvement. **Conclusion:** PRP therapy, combined with viscosupplementation and rehabilitation, was associated with progressive improvement in pain and function in this patient with early traumatic knee OA and associated structural injuries. These findings are observational and should be interpreted with caution. Further well-designed controlled studies are required to clarify the role of PRP in such patients.

KEYWORDS: Knee osteoarthritis, Platelet-rich plasma, Subchondral fracture, Meniscal injury, Viscosupplementation, Regenerative therapy

INTRODUCTION

Osteoarthritis (OA) of the knee is a progressive degenerative joint disorder involving articular cartilage, subchondral bone, synovium, and periarticular soft tissues. It is estimated to affect approximately 16% of the global population, with an incidence of about 203 per 10,000 person-years, and remains a leading cause of disability worldwide[1]. The condition is multifactorial, with established risk factors including advancing age, obesity, prior joint trauma, and chronic mechanical overloading[2, 3].

Management of knee OA is largely directed towards symptom relief and preservation of function. Non-pharmacological measures such as physiotherapy and weight management form the first-line approach, while pharmacological options include topical and oral non-steroidal anti-inflammatory drugs (NSAIDs), along with intra-articular corticosteroids or viscosupplementation for more symptomatic disease. Surgical interventions, including arthroplasty, are reserved for advanced disease. Although several agents are under investigation, no pharmacological therapy has yet demonstrated consistent

disease-modifying effects capable of halting or reversing structural progression of OA[2, 3].

In recent years, biological therapies have gained increasing attention. Platelet-rich plasma (PRP) is an autologous preparation containing a high concentration of platelets and bioactive growth factors, including platelet-derived growth factor (PDGF), transforming growth factor-β (TGF-β), vascular endothelial growth factor (VEGF), and insulin-like growth factor-1 (IGF-1). These factors are believed to modulate the intra-articular inflammatory environment, suppress catabolic pathways, and promote tissue repair[4]. The fibrinogen component of PRP may additionally promote formation of a provisional fibrin scaffold within cartilage lesions [4]. Clinical studies, including randomised trials and systematic reviews, suggest that intra-articular PRP may provide better short-term pain relief and functional improvement compared with hyaluronic acid or placebo in patients with early-to-moderate knee OA, although heterogeneity in preparation methods and study design limits definitive conclusions[5-8].

The management of traumatic knee OA accompanied by structural injuries such as subchondral fractures, ligament sprains, and meniscal degeneration remains particularly challenging. Conventional conservative measures often have suboptimal outcomes, while surgical options may not be acceptable or feasible in all patients. We report a case of early bilateral traumatic knee OA with multiple associated structural abnormalities, in which a combined approach using image-guided PRP and viscosupplementation was associated with meaningful clinical improvement. This case is notable for the coexistence of multiple pathologies in a relatively young individual and the use of targeted PRP delivery to address different anatomical components of joint injury.

CASE DESCRIPTION

Patient Profile

A 39-year-old male, working as a software engineer, presented with bilateral knee pain (right worse than left) of one year's duration. His BMI was 28.5 kg/m². He had no significant comorbidities: diabetes, hypertension, autoimmune disorders, and bleeding diatheses were specifically excluded. There was no family history of inflammatory arthritis.

Clinical Examination

On examination, there was bilateral knee joint-line tenderness, more pronounced on the medial aspect. Passive and active flexion and extension were painful in both knees, with visibly reduced range of motion. The posterior drawer test was positive for instability in the right knee. No joint effusion was clinically apparent at the time of presentation to our unit.

Investigations

Radiographic evaluation (X-ray) revealed Kellgren-Lawrence (KL) Grade 2 OA in both knees. The right knee additionally showed a fracture of the medial femoral condyle.

MRI of the left knee demonstrated mild tibiofemoral osteoarthritis with a small effusion, Grade 1 signal change in the posterior horn of the lateral meniscus, Grade 1 ACL and PCL sprain, and Grade 3 chondromalacia patella. MRI of the right knee showed mild tibiofemoral osteoarthritis, Grade 1 ACL sprain, and a subchondral fracture of the medial femoral condyle. The finding of KL Grade 2 changes on X-ray, in conjunction with MRI evidence of early cartilage and ligamentous injury, is consistent with early-stage traumatic OA superimposed on chronic mechanical degeneration. The coexistence of Grade 3 chondromalacia patella in this setting likely reflects differential vulnerability of the patellofemoral compartment to mechanical stress.

Time Point	Clinical Event
1 year prior	Onset of bilateral knee pain; managed with knee braces, NSAIDs, and physiotherapy by an orthopaedic surgeon. Limited symptomatic relief.
1 month prior	Acute twisting injury whilst dismounting from a two-wheeler vehicle; audible click followed by immediate worsening of pain and bilateral knee swelling. Managed by a local practitioner with oral and topical analgesics; temporary relief only.
Current presentation	Referred to our department following an orthopaedic opinion suggesting surgical intervention; patient declined surgery. VAS 9/10. Severely restricted mobility.
Day 1–5 (initial management)	NSAIDs and nutritional supplementation prescribed; minimal improvement. Bilateral knee MRI advised.
Week 2–3	Pre-procedure investigations completed. PRP procedure planned and informed consent obtained.
Week 3 (Day 0)	Bilateral image-guided PRP injections with viscosupplementation performed. VAS immediately post-procedure: 4/10.
Week 4	Physiotherapy initiated; VAS 4/10; WOMAC 63.
Week 8	Improved mobility; VAS 3/10; WOMAC 48; 2nd session of PRP done.
Week 12	Significant functional improvement; VAS 2/10; WOMAC 32; 3rd session of PRP done.

Table 1: Clinical timeline as per CARE guidelines

Diagnosis

Early bilateral knee OA (KL Grade 2) with the following concurrent structural injuries: subchondral fracture of the right medial femoral condyle, left lateral meniscal degeneration (Grade 1 MRI signal), bilateral Grade 1 ACL

and PCL sprain, and bilateral Grade 3 chondromalacia patella.

INTERVENTION

Pre-procedure Assessment

Routine investigations including complete blood count, prothrombin time with INR, HbA1c, fasting blood sugar, serum creatinine, hepatitis B surface antigen, and HIV serology were obtained. All results were within normal limits. Written informed consent was obtained from the patient prior to the procedure. The procedure was approved by the Institutional Review Board of KK Multispeciality Hospital.

PRP Preparation

Under aseptic precautions, 40 ml of whole blood was drawn from the left antecubital vein and collected into anticoagulant-prefilled vacutainers. The blood was then processed using a double-spin centrifugation protocol at 3500 revolutions per minute (rpm) for 15 minutes. The buffy coat and overlying plasma were carefully separated to yield approximately 3 ml of PRP per collection kit, representing a platelet concentration approximately 3–4 times higher than baseline peripheral blood, although platelet concentration was not directly quantified. No exogenous activation agent (thrombin or calcium chloride) was used prior to injection; the biological activation at the target tissue was relied upon. Two preparations were obtained: leukocyte-poor PRP for intra-articular injection and leukocyte-rich PRP for periarticular administration, based on differences in cellular composition and proposed biological effects [4].

Injection Procedure

The patient was positioned supine with a bolster under both knees. The procedure was performed under full aseptic conditions, with local anaesthetic infiltration using 2% lignocaine at the planned injection sites. Fluoroscopic (C-arm) guidance was used throughout. A small volume of iohexol contrast medium (0.5 ml per knee) was injected prior to PRP delivery to confirm correct intra-articular needle placement and to visualise distribution of the injectate within the joint space

The injection protocol was as follows:

- Intra-articular LP-PRP: 1.5 ml bilaterally (right and left knee joint spaces)
- LR-PRP, 0.5 ml to the quadriceps tendon on each side
- LR-PRP, 0.5 ml along the left lateral meniscus
- LR-PRP, 0.5 ml each to the right medial femoral condyle fracture site and to other structurally compromised areas identified on MRI
- Viscosupplementation (sodium hyaluronate) was administered to both knee joints at the same sitting

The patient was observed for 20–30 minutes post-procedure and was thereafter shifted to the ward. Physiotherapy was commenced at one week post-procedure. 2 more similar sessions were repeated with interval of 4 weeks.

OUTCOME MEASURES

Time Point	VAS Score (0–10)*	WOMAC Score (0–100)*
Baseline (pre-procedure)	9	72
Immediate post-procedure	4	-
4 weeks	4	63
8 weeks	3	48
12 weeks	2	32

Table 2: Visual Analogue Scale (VAS) for pain and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) Score for functional improvement at defined follow up points

*higher scores indicate worse symptoms

Clinical Observations

At 12 weeks, the patient reported a marked reduction in pain and was able to resume most activities of daily living without restriction. Range of motion at both knees improved to within functional limits. The posterior drawer sign was less pronounced clinically, though formal stability testing was not repeated with imaging at this follow-up point. No adverse events, including local reactions, infection, or systemic complications, were recorded.

DISCUSSION

The management of early traumatic knee osteoarthritis with associated structural injuries remains clinically challenging. In this case, the combination of a subchondral condylar fracture, meniscal degeneration, and cruciate ligament sprain, along with early osteoarthritic changes, likely contributed to persistent symptoms despite conventional therapy. The reduction in both VAS and WOMAC scores over 12 weeks suggests a meaningful clinical response in this setting.

The rationale for platelet-rich plasma (PRP) is based on its pleiotropic effects. Growth factors such as platelet-derived growth factor, transforming growth factor-β, and insulin-like growth factor-1 support chondrocyte proliferation and extracellular matrix synthesis, while vascular endothelial growth factor contributes to local angiogenesis. In addition, PRP modulates intra-articular inflammation and reduces catabolic signalling within the joint environment[4].

Clinical evidence evaluating PRP in knee osteoarthritis suggests modest but consistent improvement in pain and function, particularly in early disease. Meta-analyses of randomised controlled trials and other studies have

demonstrated improved short-term outcomes when compared with hyaluronic acid or placebo, although heterogeneity in PRP preparation and study design limits definitive conclusions[5-8].

Earlier clinical studies have also reported favourable outcomes. Wang-Saegusa *et al*.[9] demonstrated significant improvement in pain and functional scores following intra-articular PRGF injections evaluating 261 patients with OA of Outerbridge grades I–IV. Similarly, Sampson *et al*.[10] and Halpern *et al*.[11] reported improvement in clinical outcomes in small patient cohorts, though these studies were limited by sample size and methodological variability. A synergistic effect of combining PRP with hyaluronic acid has also been described by Gupta *et al*., which supports the rationale for concurrent viscosupplementation in the present case[12].

Sánchez *et al*.[13] described the use of PRGF in a case of chondral injury following surgical fixation, demonstrating favourable functional recovery. Although not directly comparable, this suggests a possible role of PRP in augmenting repair at sites of structural damage, as applied in the present case. In addition, emerging evidence from systematic reviews indicates a potential role for PRP in bone healing and fracture repair, although clinical findings remain heterogeneous and inconclusive[14, 15].

In the present case, a combination approach was adopted, with intra-articular administration of leukocyte-poor PRP and targeted periarticular delivery of leukocyte-rich PRP. This strategy was based on differences in cellular composition and proposed biological effects, although evidence guiding such differentiation remains limited and largely extrapolated from experimental and early clinical studies[4]. The concurrent use of viscosupplementation was intended to improve joint lubrication and provide mechanical support during the recovery phase.

Limitations

Some important limitations must be acknowledged. It represents a single case without a control comparator, and causal inference cannot be established. The observed improvement may partly reflect the natural course of disease, placebo effect, or the impact of concurrent physiotherapy. The follow-up duration was limited to 12 weeks, and it remains unknown whether the symptomatic benefit is durable. Platelet concentration and growth factor levels were not quantified. No activation agent was used, and post-procedure imaging was not performed to assess structural changes. Variability in PRP preparation and administration further limits generalisability. The CARE guidelines were followed in reporting this case[16].

CONCLUSION

In this patient with early bilateral traumatic knee osteoarthritis and associated structural injuries, an image-guided platelet-rich plasma (PRP) intervention, combined with viscosupplementation and structured physiotherapy, was followed by progressive reduction in pain and improvement in functional scores over a 12-week period. The use of both intra-articular leukocyte-poor PRP and targeted periarticular leukocyte-rich PRP enabled a tailored approach to this complex, multi-compartment pathology.

These observations are based on a single case and should be interpreted with caution. Further well-designed randomised controlled trials, particularly in patients with traumatic osteoarthritis and concurrent structural abnormalities, are required to clarify the clinical role of PRP beyond standard conservative management.

DISCLOSURE

Consent for Publication: Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the consent form is available for review by the editors upon request.

Ethics Approval: This case report was approved by the Institutional Review Board of KK Multispecialty Hospital.

Data Availability: The clinical data pertaining to this case are available from the corresponding author upon reasonable request.

Conflict of Interest: The authors declare no conflicts of interest and have no financial relationship with any manufacturer of PRP preparation systems or related devices.

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