E-ISSN: 3068-3726
Journal of Orthopaedic Science and Research

ATHENAEUM SCIENTIFIC PUBLISHERS

Case Report

Magnetic Resonance Imaging (MRI)-Documented Re-continuity of a Complete Anterior Cruciate Ligament Rupture After Delayed Platelet-Rich Plasma Treatment in a 65-Year-Old Male: A Case Report

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Citation: Sherif Z, et al. Magnetic Resonance Imaging (MRI)-Documented Re-continuity of a Complete Anterior Cruciate Ligament Rupture After Delayed Platelet-Rich Plasma Treatment in a 65-Year-Old Male: A Case Report. J Ortho Sci Res. 2026;7(2):1-8.

https://doi.org/10.46889/JOSR.2026.7208

Received Date: 18-05-2026

Accepted Date: 14-06-2026

Published Date: 21-06-2026

Abstract

Background: Complete Anterior Cruciate Ligament (ACL) rupture has traditionally been considered to have limited intrinsic healing capacity, particularly in older patients and delayed presentations. Recent literature has challenged this assumption, with MRI-documented ACL continuity reported after selected conservative protocols, cross-bracing, rehabilitation-only management and Platelet-Rich Plasma (PRP) treatment. However, most reported healing cohorts involve younger, active or acutely treated patients.

Objective: To describe MRI-documented re-continuity of a complete ACL rupture in a 65-year-old male following delayed commencement of image-guided PRP-based conservative management.

Case presentation: A 65-year-old male sustained an acute left knee injury. MRI performed one day post-injury demonstrated complete rupture of the left anterior cruciate ligament. Platelet-rich plasma treatment commenced approximately six weeks post-injury. The patient underwent five image-guided PRP treatments between six weeks and 14 weeks post-injury. Serial MRI examinations were performed at one day, six weeks, 14 weeks and 50 weeks post-injury.

Results: The six-week MRI demonstrated persistent severe ACL abnormality without mature ligamentous continuity. By 14 weeks post-injury, MRI demonstrated improved fibre organisation and apparent re-continuity along the expected ACL course. At 50 weeks post-injury, high-resolution MRI demonstrated further maturation of a continuous low-signal ACL-like structure. The patient reported restoration of movement and return to normal everyday function by approximately 14 weeks post-injury.

Conclusion: This case does not establish causation or suggest that all complete ACL ruptures should be managed non-operatively. Its significance lies in documenting ACL re-continuity in an older patient after delayed commencement of biologically supported conservative care without bracing, supporting further prospective investigation into patient selection, treatment timing, PRP composition, MRI repair markers and objective stability outcomes.

Keywords: Anterior Cruciate Ligament; ACL Rupture; Platelet-Rich Plasma; Orthobiologics; Magnetic Resonance Imaging (MRI); Ligament Healing; Conservative Treatment; Older Patient; Knee Injury; Sherif ACL Protocol

Abbreviations

ACL: Anterior Cruciate Ligament; MRI: Magnetic Resonance Imaging; PAW: Platelet Number, Activation and White Blood Cell Classification System; PRP: Platelet-Rich Plasma

Introduction

Complete rupture of the anterior cruciate ligament (ACL) has historically been treated as an injury with limited potential for intrinsic healing. This view is based on the ACL's intra-synovial location, exposure to synovial fluid, difficulty sustaining a provisional fibrin-platelet bridge between torn ligament ends, synovial-fluid mediated disruption of repair biology and the mechanical strain placed on the ligament during knee motion [1,2]. For patients with symptomatic instability, high functional requirements or return-to-sport goals, ACL reconstruction remains a well-established treatment pathway.

This conventional position has been increasingly challenged. MRI-documented ACL continuity after complete rupture has been reported after selected non-operative management, rehabilitation-only pathways, protective bracing and cross-bracing protocols [3-6]. In the KANON secondary analysis, MRI evidence of ACL healing was observed in a proportion of adults initially managed with rehabilitation alone and healed ACL morphology was associated with more favourable patient-reported outcomes [3]. The Cross Bracing Protocol has further demonstrated that, in selected acute ACL ruptures, mechanical approximation of the torn ACL ends may be associated with a high rate of MRI-defined healing at three months [4]. Earlier Japanese work also reported spontaneous healing in selected acute ACL injuries treated with bracing [5]. Costa-Paz, et al., also documented spontaneous healing of complete ACL ruptures in a clinical and MRI study, reinforcing that structural re-continuity may occur in selected cases without surgical reconstruction [6].

Conservative management is not without risk. Takata, et al., reported that although most young athletes returned to competition during the same season after conservative treatment, performance was substantially reduced, giving-way episodes were common and meniscal or chondral injuries were frequently identified at later reconstruction [7].

More recent concern has also been raised regarding the durability of the Cross Bracing Protocol specifically. Porter and Shadbolt reported substantially higher recurrent instability in patients managed with the Cross Bracing Protocol compared with surgical stabilisation at two-year follow-up, concluding that the protocol was associated with an unacceptably high failure rate in young patients participating in pivoting sports [8]. This finding should be interpreted as evidence relating to a specific mechanical bracing protocol, rather than as a uniform assessment of all non-operative ACL strategies. Orthobiologic approaches, including image-guided PRP-based protocols, do not rely on prolonged high-flexion immobilisation to the same degree and equivalent long-term comparative data are not yet available.

More recently, PRP has been investigated as a biologic component of non-operative ACL management. Hada et al. reported a retrospective series of 10 highly active sports patients with acute ACL injuries who were treated without surgical reconstruction using a PRP-centred conservative protocol. MRI confirmed regained ACL continuity in all 10 patients before return to sport. All patients returned to their pre-injury activity level, reported as Tegner Activity Scale 7.0, at a mean of 139.5 days or 4.6 months, after injury. Only one re-rupture occurred after return to sport; notably, this was the patient who had received the fewest PRP treatments and had the least favourable MRI repair grade in the cohort [9].

Sherif, et al., reported rapid MRI-documented ACL re-continuity in a 38-year-old male with a complete ACL rupture and 13.6 mm stump gap on baseline 3T MRI. Following seven image-guided orthobiologic treatments using high-platelet-dose, leukocyte-rich, non-exogenously activated PRP classified as PAW P4-Aα, serial MRI demonstrated early bridging by 10 days, robust fibre continuity by 33 days and progressive maturation by 52 days. The patient reported normal knee function by approximately 30 days, with no instability or re-injury at eight-week follow-up [10]. Although limited by its single-case design, the report provides serial imaging evidence that rapid structural re-continuity may occur after complete ACL rupture under a biologically supported, image-guided non-operative protocol.

The present case extends this literature in a clinically important direction. Unlike most reported ACL healing cohorts, this patient was 65 years old, did not commence PRP treatment until approximately 6 weeks after injury and did not utilise bracing during the treatment period. This combination places the case outside the typical acute, young, mechanically protected or athlete-dominant populations in which ACL re-continuity has most commonly been described. It therefore raises the question of whether biologically supported ligament repair may remain possible in selected older patients and delayed presentations, provided serial imaging demonstrates a favourable repair trajectory.

Biological studies suggest that ACL remnant-derived cells and vascular-derived progenitor cell populations demonstrate age-related differences, with younger tissue generally showing greater cellular activity, differentiation capacity and healing potential [11,12]. Healing potential also appears to be influenced by the interval from injury, with remnant tissue harvested within three months of injury demonstrating higher biological potential than later-stage tissue [13]. Therefore, this case sits outside the usual acute, young-athlete narrative and introduces an important question: whether selected older patients with delayed presentations may still demonstrate clinically meaningful ACL re-continuity under biologically supported conservative conditions.

Methodology

Study Design

This manuscript describes a single-patient clinical case report with serial MRI follow-up. The purpose was to document the clinical chronology, PRP intervention details and MRI morphological changes following delayed image-guided PRP-based conservative management of a complete ACL rupture in an older patient.

Participant

The participant was a 65-year-old male who sustained an acute left knee injury and underwent MRI one day post-injury, demonstrating complete rupture of the left ACL. The patient did not undergo surgical reconstruction or bracing during the treatment period.

Data Collection

Data were obtained from clinical records, treatment chronology, PRP procedural documentation and serial MRI examinations. MRI examinations were performed at one day, approximately six weeks, 14 weeks and 50 weeks post-injury. The PRP treatment series consisted of five image-guided autologous PRP injections administered between approximately six and 14 weeks post-injury.

Data Analysis

Imaging assessment was descriptive and morphological. Serial MRI examinations were reviewed chronologically for ACL fibre continuity, signal characteristics, organisation of the ligament remnant and maturation of an ACL-like low-signal structure. No formal statistical analysis was performed because this was a single-patient case report.

Case Report

A 65-year-old male sustained an acute left knee injury. MRI performed one day post-injury demonstrated complete rupture of the left anterior cruciate ligament. The patient did not undergo surgical reconstruction. PRP treatment commenced on day 43 post-injury, approximately six weeks after injury. A pretreatment MRI was performed on the same day, demonstrating persistent severe ACL abnormality before commencement of the PRP treatment series.

The patient underwent five PRP treatments between 6 and 14 weeks post-injury, over an 8 week treatment interval. A third MRI was performed 14 weeks post-injury, immediately following completion of the fifth PRP injection. The patient reported restoration of movement and return to normal everyday function by this time. A fourth MRI was performed at 50 weeks post-injury, approximately 44 weeks after PRP commencement and 36 weeks after the final PRP treatment, to assess longer-term ligament morphology.

The patient abstained from anti-inflammatory medication for two weeks before PRP commencement and throughout the treatment period (Table 1).

Time Point	Time Post-Injury	Time After PRP Commencement	Event
Injury	0 days	NA	Left knee injury
MRI 1	1 day	NA	First MRI demonstrating complete ACL rupture
MRI 2 / PRP 1	43 days (~ 6 weeks)	0 days	Pretreatment MRI and first PRP injection

PRP 2	54 days (~ 8 weeks)	11 days (~ 1.5 weeks)	Second PRP injection
PRP 3	65 days (~ 9 weeks)	22 days (~ 3 weeks)	Third PRP injection
PRP 4	82 days (~ 12 weeks)	39 days (~ 5.5 weeks)	Fourth PRP injection
PRP 5 / MRI 3	97 days (~ 14 weeks)	54 days (~ 8 weeks)	Fifth PRP injection and third MRI
Clinical report	97 days (~ 14 weeks)	54 days (~ 8 weeks)	Patient reported restoration of movement and normal function
MRI 4	352 days (~ 50 weeks)	309 days (~ 44 weeks)	Fourth MRI demonstrating further ACL maturation

Table 1: Chronology of injury, imaging and treatment.

Intervention

The patient underwent five image-guided autologous PRP treatments between 6 weeks and 14 weeks post-injury. No brace or mechanical cross-bracing protocol was used during the treatment period, distinguishing this case from previously reported mechanical approximation protocols.

For each treatment, PRP was prepared from either 90 mL or 180 mL of autologous whole blood, according to the planned biologic dose and treatment-session requirements. This produced approximately 8-10 mL of final injectate. Individual platelet concentration, leukocyte count, neutrophil count, red blood cell count and total platelet dose were not available for each treatment session; therefore, PRP classification was based on the preparation protocol and its alignment with the previously published Sherif ACL Protocol [10]. In keeping with contemporary recommendations for PRP reporting, preparation and delivery variables were described to support interpretation and comparison with other biologic protocols [14]. The preparation was classified according to the PAW system as P4-Aα [15].

Immediately prior to each injection, the knee joint was aspirated where effusion was present. This was performed to reduce intra-articular dilutional effects and permit more controlled delivery of the biologic injectate. PRP was then administered under image guidance, targeting the injured ACL region and remnant tissue according to MRI-defined morphology.

Results

Four MRI examinations were reviewed in chronological sequence (Fig. 1). Serial MRI demonstrated progressive change in ACL morphology across four time points. The initial MRI, performed one day post-injury, demonstrated complete ACL rupture, with loss of normal fibre continuity and abnormal high signal along the expected ACL course.

The second MRI, performed approximately 6 weeks post-injury on the day PRP treatment commenced, continued to show severe ACL abnormality without a mature, organised low-signal ligamentous band. This time point is important because it establishes that clear structural re-continuity was not evident before the PRP treatment series.

By 14 weeks post-injury, after five PRP treatments, MRI demonstrated improved fibre organisation and apparent re-continuity along the expected ACL trajectory. At 50 weeks post-injury, high-resolution sagittal 3D proton-density fat-suppressed MRI demonstrated further maturation of a continuous low-signal ACL-like structure. Taken together, the imaging sequence demonstrated a transition from acute complete rupture, to persistent disruption at approximately six weeks, followed by progressive re-continuity and longer-term structural maturation.

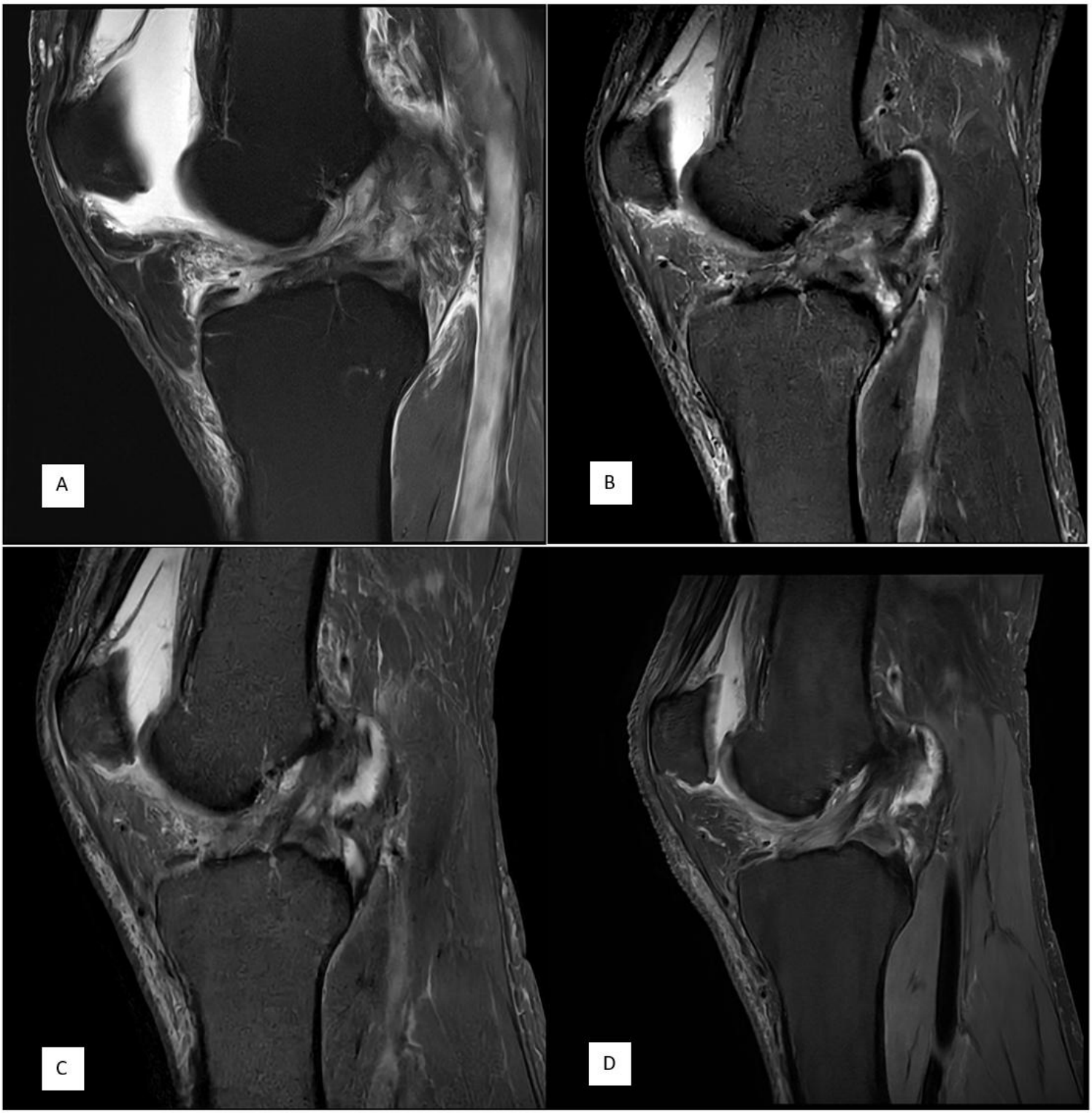

Figure 1: Serial sagittal MRI of the left anterior cruciate ligament from acute rupture to delayed re-continuity. (A) MRI performed one day post-injury demonstrates complete ACL rupture with loss of normal fibre continuity; (B) MRI performed approximately 6 weeks post-injury, immediately before PRP treatment commenced, demonstrates persistent severe ACL abnormality without mature ligamentous re-continuity; (C) MRI performed 14 weeks post-injury, after five PRP treatments, demonstrates improved fibre organisation and apparent re-continuity along the expected ACL course; (D) High-resolution sagittal 3D proton-density fat-suppressed MRI performed 50 weeks post-injury demonstrates further maturation of a continuous ACL-like low-signal structure.

Discussion

This case demonstrates serial MRI-documented re-continuity of a complete ACL rupture in a 65-year-old male following delayed, image-guided PRP-based conservative treatment. Its significance is not that ACL healing without surgery is unprecedented. Spontaneous healing, rehabilitation-associated healing, bracing-assisted healing, cross-bracing protocols and PRP-centred conservative treatment have all previously been reported [3-6,9,10]. Rather, the value of this case lies in the combination of patient age, delayed treatment commencement, absence of bracing and serial MRI evidence of progressive structural maturation. These features place the case outside the younger, acute and mechanically protected populations that dominate much of the current ACL-healing literature.

The prevailing historical view has been that the ruptured ACL has limited intrinsic healing capacity, primarily due to the intra-articular environment, synovial fluid exposure, lack of a stable fibrin bridge and persistent mechanical strain [1,2]. Nevertheless, multiple studies have now shown that selected ACL ruptures may regain continuity. Fujimoto, et al., reported stable outcomes in selected acute ACL injuries treated with an extension-block soft brace [5]. Filbay, et al., demonstrated MRI evidence of ACL healing in a subset of patients from the KANON trial who were initially managed with rehabilitation rather than early reconstruction [3]. In a separate cohort, Filbay et al., reported high rates of MRI-defined healing at three months following the Cross Bracing Protocol [4]. These studies support the principle that ACL healing is biologically possible under selected mechanical and clinical conditions.

PRP introduces a different but related concept: biological support of the healing environment. Platelets release growth factors and cytokines implicated in angiogenesis, fibroblast activity, collagen synthesis and extracellular matrix remodelling [16]. In ACL-specific biologic repair models, platelet-based scaffolding has also been investigated as a strategy to address the failure of stable clot or bridge formation within the intra-articular environment [2]. Hada, et al., reported MRI-confirmed regained ACL continuity in highly active patients treated with PRP within six weeks of injury, with return to pre-injury Tegner activity level in an average of 139.5 days and one reported re-rupture [9]. Sherif, et al., reported MRI-documented bridging and morphological re-continuity of a complete ACL rupture using the Sherif ACL Protocol, a high-dose PRP-based orthobiologic protocol [10]. The present case extends that early protocol experience into a different clinical context, involving an older patient, delayed treatment commencement and no use of bracing.

Age is one of the most important features of this case. Biological studies suggest that ACL healing potential is not uniform across age groups. Nakano, et al., showed that ACL remnant-derived cells from younger patients enhanced early tendon-bone healing more effectively than cells derived from older patients in a controlled laboratory model [11]. Uefuji, et al., reported age-related differences in ACL remnant vascular-derived cells, with younger patients demonstrating more favourable cellular characteristics relevant to repair [12]. Zhang, et al., further reported that ACL remnant tissue harvested within three months of injury demonstrated higher healing potential, including greater stem-like cell fractions and expansion capacity [13]. These studies do not establish an age threshold beyond which ACL repair cannot occur, but they support the biological premise that healing potential may diminish with age and chronicity.

Indirect evidence also suggests that age may influence response to autologous PRP. Although not ligament-specific, Brinks, et al., reported age-dependent variation in PRP response in androgenetic alopecia, with older patients appearing to require more treatment sessions to achieve comparable gains [17]. This supports considering age when interpreting PRP-assisted repair, while recognising that direct ACL-specific evidence remains limited.

That context makes the current case clinically relevant. The patient was 65 years old and PRP was commenced approximately 6 weeks post-injury. This is later than many acute mechanical approximation protocols and outside the typical young-athlete demographic. Despite this, serial MRI demonstrated progressive morphological re-continuity and later maturation of a continuous ACL-like structure. The finding raises the possibility that, in selected patients, the biologic window for ACL repair may extend beyond the immediate acute phase and may not be limited to young patients.

The case should also be interpreted in the context of treatment decision-making for older patients. ACL reconstruction can be successful in selected active patients older than 60 years, particularly when instability persists and the patient has high functional demands [18,19]. Therefore, this case should not be interpreted as arguing against surgery when surgery is clinically indicated.

Rather, it suggests that the binary assumption that a complete ACL rupture in an older patient must inevitably proceed to reconstruction may be too simplistic. In patients with acceptable functional demands, willingness to comply with rehabilitation and close imaging follow-up, a biologically supported conservative trial may warrant further investigation.

Several limitations must be acknowledged. This is a single case report and cannot establish causation. Spontaneous healing cannot be excluded. The clinical outcome was based on patient-reported recovery of movement and everyday function. No contemporaneous formal physical examination findings were available for publication, including Lachman testing, pivot-shift grading or instrumented arthrometric laxity assessment. Validated patient-reported outcome measures and objective return-to-activity testing were also not available. MRI continuity does not necessarily equate to normal mechanical strength, rotational stability, proprioceptive recovery or suitability for pivoting sport. MRI interpretation was descriptive and morphological rather than based on a validated quantitative ACL healing score and there was no arthroscopic confirmation of the MRI appearance. The PRP intervention was delivered alongside natural healing biology and functional rehabilitation and the relative contribution of each cannot be separated.

Despite these limitations, the case is hypothesis-generating. It supports the need for prospective studies examining biologically assisted ACL healing in older and delayed-presentation populations. Future studies should report PRP composition and delivery variables in detail, including platelet concentration, leukocyte count, neutrophil count, red blood cell count, activation method, total PRP volume, injected volume, delivery method and number of injections [14,15]. Objective laxity testing and validated functional measures should be incorporated alongside serial MRI.

Conclusion

This case documents progressive MRI-demonstrated re-continuity of a complete ACL rupture in a 65-year-old male following delayed, image-guided PRP-based conservative treatment commencing approximately 6 weeks after injury. The patient reported restoration of movement and return to normal everyday function by approximately 14 weeks post-injury and MRI at 50 weeks demonstrated further maturation of a continuous ACL-like structure. This case does not establish that PRP caused ACL repair, nor does it suggest that all complete ACL ruptures should be managed non-operatively. Its significance lies in documenting ACL re-continuity in an older patient after delayed commencement of biologically supported conservative care without bracing. The findings support further prospective investigation into patient selection, treatment timing, PRP dose and composition, MRI markers of ligament repair and objective measures of functional stability.

Conflict of Interest

The authors provide diagnostic imaging and image-guided orthobiologic treatments in clinical practice. The authors declare no other conflicts of interest relevant to this case report.

Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial or non-profit sectors.

Acknowledgement

The authors acknowledge the clinical and administrative staff involved in patient care and imaging coordination. No professional medical writing assistance was used.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethical Statement

This manuscript describes a single de-identified clinical case report. Formal institutional ethics review was not required under local policy for publication of a single case report, provided written informed consent for publication was obtained.

Informed Consent Statement

Written informed consent was obtained from the patient for inclusion of clinical details in this case report.

Authors' Contributions

ZS contributed to clinical care, imaging review, procedural treatment and manuscript development. KS contributed to manuscript drafting, literature review and critical revision. AF contributed to research governance, manuscript review and referencing.

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