

Posterior Cruciate Ligament Avulsion Fracture with Non-Displaced Patellar Fracture: A Case Report

A. Zaizi^{1*}, O. Azriouil¹, N. El Ghoule¹, H. Sallahi¹, A. Benbouha¹, O. Margad², B. Chagar³

¹Department of Orthopaedic Surgery & Traumatology, Avicenne Military Hospital, Faculty of Medicine and Pharmacy, Cadi Ayyad, Marrakech 40000, Morocco

²Head of the Orthopaedic Surgery & Traumatology Division, Avicenne Military Hospital of Marrakech

³Director of the Avicenne Military Hospital of Marrakech

DOI: <https://doi.org/10.36347/sasjs.2026.v12i10.008>

| Received: 22.08.2026 | Accepted: 13.10.2026 | Published: 15.10.2026

*Corresponding author: A. Zaizi

Department of Orthopaedic Surgery & Traumatology, Avicenne Military Hospital, Faculty of Medicine and Pharmacy, Cadi Ayyad, Marrakech 40000, Morocco

Abstract

Case Report

An avulsion fracture of the posterior cruciate ligament (PCL) occurs when the ligament pulls a fragment of bone away from its attachment site rather than tearing through its own substance. It's a rare injury and is missed most often, particularly when associated with multiple injuries or fractures around the knee and hip. While avulsions can theoretically occur at either the femoral or tibial attachment, the tibial insertion is by far the more commonly affected site and is the focus of most of the clinical literature. This injury pattern is especially frequent in young, active patients and is a classic finding after high-energy trauma such as motor vehicle or motorcycle collisions, falls onto a flexed knee, or sports injuries involving a "dashboard"-type mechanism. Surgical fixation can be achieved either by open or arthroscopic technique but open reduction and internal fixation (ORIF) is the gold standard. There are several studies on surgical fixation of isolated PCL avulsion fractures.

Keywords: Avulsion fracture, knee injury, posterior cruciate ligament, patellar fracture, physical therapy.

Copyright © 2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Posterior cruciate ligament (PCL) avulsion fractures of the tibia are characterized by the detachment of the ligament from its bony insertion site. It poses a distinct challenge to orthopedic surgeons due to the intricate anatomy and pathophysiology, essentially if there is associated lesions or fractures. The PCL plays a crucial role in maintaining the stability of the knee joint by preventing posterior displacement of the tibia relative to the femur. Many surgical techniques exist, ranging from non-operative measures to surgical fixation through open or arthroscopic approach using a diverse range of materials such as hollow lag screws, steel wires, absorbable screws and suture anchors. The choice of intervention depends on factors such as the size and displacement of the avulsed fragment, associated injuries, and the patient's functional demands. [1]

In this article, we approach this rare lesion and review the main indications for nonoperative and operative management of patients with PCL avulsion fractures associated with patellar fracture and discuss major surgical outcomes.

CASE PRESENTATION

We report a case of a 22-year-old male presented at our Emergency Department with right knee and left forearm injury which occurred after motorcycle injuries with the complaints of pain and the inability to walk and left forearm was holding by the right one. Physical examination found deformed left forearm and right knee swelling, an intact skin without neurovascular injury, radiographs revealed radial shaft comminuted fracture, posterior bony fragment avulsion from the tibial plateau with associated non-displaced patellar fracture (Fig. 1,2). CT scan well characterized the fragment size, displacement, and comminution, and is very useful for surgical planning (Fig. 3). In prone position radial fracture was addressed first through lateral approach to the forearm using a long plate with screw (Fig. 4), then avulsion fracture was treated with ORIF using an inverted "L"-shaped incision, starting from the medial aspect of the gastrocnemius and curving along the joint's flexor crease toward the lateral side. The fascia was cut following the path of the skin incision. The capsule was reached through the space between the semimembranosus and gastrocnemius. A lengthwise

incision was made, exposing the joint at the location of the avulsed fragment. The avulsed fragment was carefully refreshed and realigned, a slight flexion of the knee joint aided in the reduction process. Temporary fixation was achieved using a K-wire to maintain the reduction followed by a drilling with a cannulated drill bit. Final fixation used a 4 mm partially threaded cannulated cancellous screw with washer (Fig. 5) then the limb was immobilized using a hinged knee brace for a duration of 6 weeks for patellar undisplaced fracture and operated tibial avulsed fragment 854mm obilization. A progressive passive knee bending in the prone position commenced at 6-week then active mobilization of the knee was initiated approximately 8 weeks post-surgery, after complete patellar fracture union. The clinical outcome was measured using the Tegner modified Lysholm knee scoring scale and objective tests like tibial sag sign and posterior drawer test at 3, 6 and 12 months following fixation.



Figure 1: AP and lateral x-rays showing displaced midshaft radial fracture



Figure 2: AP and lateral x-rays showing displaced PCL facet fracture with nondisplaced inferior pole patella fracture

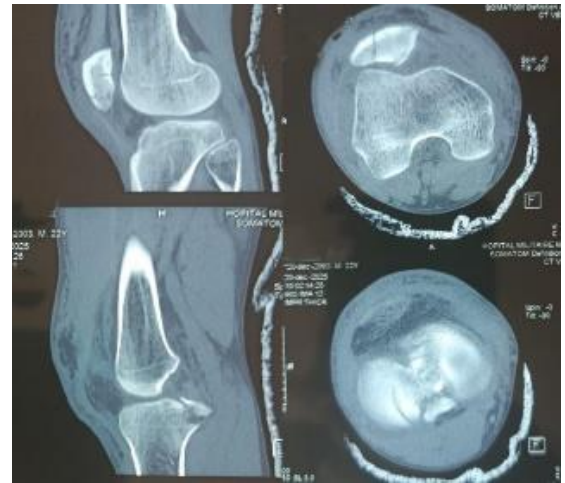


Figure 3: CT scan sagittal and axial cut showing displaced PCL avulsion fracture with nondisplaced patellar fracture



Figure 4: Post operative x-rays showing screw and washer fixation of displaced bone fragment.



Figure 5: Post operative x-rays showing plate fixation of radial fracture

DISCUSSION

The PCL is the primary restraint against posterior translation of the tibia relative to the femur. When a strong posteriorly directed, force is applied to the proximal tibia with the knee flexed, the classic "dashboard injury" in a car accident or a fall directly onto a flexed knee, the tensile force is transmitted through the ligament. In skeletally immature or otherwise vulnerable bone, the bony insertion fails before the ligament fibers do, producing a fracture fragment rather than a mid-substance ligament tear. [1,2]

The occurrence of both a patellar fracture and an avulsion fracture at the tibial attachment of the PCL is rarely documented in existing literature. Hooper *et al.*, reported that 16.8% of PCL avulsion fractures were associated with meniscal injuries, while 19.1% involved additional ligament injuries. [3,4] Delay in diagnosis remains a persistent concern in the literature because plain radiographs can under-appreciate small or minimally displaced fragments, injuries are sometimes missed until chronic instability or secondary osteoarthritic change has already developed, reinforcing the value of a low threshold for MRI in trauma patients with posterior knee pain or hemarthrosis.

PCL tibial avulsion fractures are most commonly graded using the Meyers–McKeever classification, originally described for tibial eminence fractures and adapted to this injury; type I describe a minimal displacement of the bony fragment, type II for partial displacement, with the posterior portion of the fragment still hinged in contact with the donor site, while type III indicated a complete displacement of the fragment from its bed and type IV reserved for comminuted fracture fragment.

Types II and III commonly require surgical intervention via open or arthroscopic reduction and fixation, while Type I injuries are more often amenable to nonoperative treatment. [5]

The literature on PCL tibial avulsion fractures has changed markedly over the past two decades, moving from open posterior surgery as the default toward a growing preference for arthroscopic and minimally invasive alternatives. This evolution reflects a broader trend in orthopedic trauma toward techniques that preserve soft-tissue envelopes and reduce approach-related morbidity. However ORIF through a posterior inverted L-shaped offers the potential for a clearer view of the fractured bone and allows for complete fracture reduction followed by effective fixation of bone fragments and no neurovascular complications, alongside solid functional outcomes at follow-up. Arthroscopic repair is minimally invasive and had the ability to address concurrent injuries such as meniscal and synovial damage, but is a complex procedure with high technical demands, a prolonged learning curve, and specific equipment requirements. Regarding the choice between screw and plate fixation versus suture-suspensory techniques is dictated by fragments sizes, a large one can easily be fixed with screws or small plates placed through a direct posterior approach. However, comminuted or smaller fragments are often poorly suited to rigid hardware, which has driven interest in high-strength suture fixation combined with button or loop plates. This approach distributes load across the ligament-bone interface rather than a single fragment and may reduce the risk of bone fragmentation during fixation, though comparative long-term data against screw fixation are still limited. In practice, the decision

is rarely driven by a single best technique but by a combination of factors: fragment size and comminution (Meyers-McKeever grade), degree of displacement, surgeon experience and available instrumentation, and the presence of associated injuries such as meniscal tear, collateral ligament lesion, patellar or other periarticular fractures, that may necessitate a combined or staged surgical plan. [6,7,8]

In our case the associated undisplaced patellar fracture involved a prolonged immobilisation for 6 weeks post-surgery rather than a short 4 weeks. Regardless of technique, postoperative rehabilitation is important and follows a staged protocol, initial protection with bracing in extension and restricted weight-bearing, then gradual restoration of range of motion, avoiding early aggressive flexion that stresses the healing fragment and progressive quadriceps and hamstring strengthening. Return to sport or full activity generally is possible only after radiographic union and functional milestones are met, often several months post-injury. Complications and Prognosis are related to missed or inadequately treated injuries and can lead to chronic PCL insufficiency, posterior knee instability, and accelerated patellofemoral or tibiofemoral osteoarthritis. Surgical risks include injury to the popliteal neurovascular structures particularly with open posterior approaches, stiffness or arthrofibrosis, and residual laxity. With timely diagnosis and appropriate fixation, outcomes are generally good, with high rates of fracture union and satisfactory functional knee scores reported across the various fixation techniques described above. [9,10]

Much of the published outcome data comes from retrospective case series rather than randomized or prospective comparative trials, and follow-up periods, though often reported as satisfactory rarely extend long enough to fully characterize the risk of late degenerative change. Standardized, larger comparative studies, ideally stratified by Meyers–McKeever grade and fragment characteristics would help clarify whether any single fixation strategy offers a meaningful advantage over the others, or whether current outcomes are already converging regardless of technique. [11,12]

CONCLUSIONS

PCL avulsion fractures most often occur at the tibial insertion following a posteriorly directed force on a flexed knee, associated patellar fracture is very rare. The Meyers–McKeever Types II and III generally require surgical fixation. Multiple modern fixation techniques exist (open, arthroscopic, minimally invasive, suture-suspensory), each with a good track record when matched appropriately to the fracture pattern.

Declaration of Competing Interest: None.

Funding: None.

REFERENCES

1. Amrit G, Yuvraj V, Vivek M *et al.*, A Rare Case Report: Managing PCL Avulsion Fracture with a Fracture of the Proximal Tibial Shaft. *Jocr*. 2025;15(1):177-82. doi:10.13107/jocr.2025.v15.i01.5168
2. Bertrand ML, Andrés-Cano P, Pascual-López FJ: Periarticular fractures of the knee in polytrauma patients. *Open Orthop J*. 2015, 9:332-46. 10.2174/1874325001509010332
3. Gangwani N, Phansopkar P. Concurrent Undisplaced Patellar Fracture and Posterior Cruciate Ligament Avulsion Fracture Managed with Surgical Fixation and Rehabilitation: A Case Report. *Cureus*. 19 juill 2024. doi:10.7759/cureus.64931
4. Hooper PO 3rd, Silko C, Malcolm TL, Farrow LD. Management of Posterior Cruciate Ligament Tibial Avulsion Injuries: A Systematic Review. *Am J Sports Med*. 2018 Mar;46(3):734-742. doi: 10.1177/0363546517701911. Epub 2017 Apr 24. PMID: 28437619
5. Meyers MH, McKee FM. Fracture of the intercondylar eminence of the tibia. *J Bone Joint Surg Am* 1978;52:1677-84.
6. Gwinner C, Märdian S, Schwabe P, Schaser KD, Krapohl BD, Jung TM: Current concepts review: Fractures of the patella. *GMS Interdiscip Plast Reconstr Surg DGPW*. 2016, 5: Doc01. 10.3205/iprs000080
7. Li H, Wang W, Liu YJ, et al.: Closed patella fracture combined with cruciate ligament injury: a case control study. *Chin Med J (Engl)*. 2023, 126:3856-9. 10.3760/cma.j.issn.0366-6999.20131826
8. Lysholm J, Gillquist J. Evaluation of knee ligament surgery results with special emphasis on use of a scoring scale. *Am J Sports Med* 1982;10:150-4.
9. Yoon YC, Jeon SS, Sim JA, Kim BK, Lee BK: Concomitant posterior cruciate ligament injuries with direct injury-related patellar fractures . *Arch Orthop Trauma Surg*. 2016, 136:779-84. 10.1007/s00402-016-2449-1
10. Guo H, Zhao Y, Gao L, et al.: Treatment of avulsion fracture of posterior cruciate ligament tibial insertion by minimally invasive approach in posterior medial knee . *Front Surg*. 2022, 9:885669. 10.3389/fsurg.2022.885669
11. Lu HX, Huangpu XQ, Zhang J. Treatment of acute posterior cruciate ligament avulsion fracture with arthroscopically assisted cannulated screw fixation. *J Pract Orthop* 2012;18:797-9.
12. Lee B, Yoon D, Yim J: Effects of an early exercise program with cryotherapy on range of motion, pain, swelling, and gait in patients with total knee arthroplasty: a randomized controlled trial. *J Clin Med*. 2024, 13:10.3390/jcm13051420