

# Management of a Rare Combined Osseoligamentous Knee Injury: Tibial Plateau Fracture with High-Grade Posterior Cruciate Ligament Tear Treated by Arthroscopic Reconstruction and Osteosynthesis - A Case Report

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## Learning Point of the Article:

Early MRI evaluation and single-stage combined arthroscopic PCL reconstruction with open osteosynthesis are essential for restoring stability and achieving good functional outcomes in complex tibial plateau fractures with associated ligament injuries.

## Abstract

**Introduction:** Tibial plateau fractures (TPFs) are intra-articular injuries accounting for approximately 1% of all fractures and are frequently associated with soft-tissue and ligamentous injuries. Medial condyle fractures (Schatzker type IV) are uncommon but often result in instability, particularly when associated with posterior cruciate ligament (PCL) injury. Such combined injuries are complex and may be underdiagnosed, especially following delayed presentation. We report a rare case of a medial TPF with high-grade PCL injury managed using a combined arthroscopic and open surgical approach.

**Case Report:** An 18-year-old male presented 45 days after a high-velocity motorbike accident with persistent knee pain, swelling, and instability following initial native bandaging therapy. Clinical examination and imaging, including radiographs and magnetic resonance imaging (MRI), were performed. A single-stage surgical management comprising arthroscopic PCL reconstruction and open reduction and internal fixation (ORIF) of the tibial plateau was undertaken.

**Results:** Radiographs demonstrated a depressed medial TPF (Schatzker type IV) with fibular head fracture. MRI revealed a high-grade PCL tear with posterior tibial translation and no other ligamentous injury. Arthroscopic PCL reconstruction was performed using a quadrupled hamstring graft, followed by ORIF of the medial tibial plateau with a locking compression plate and corrective osteotomy. Post-operatively, the patient underwent staged rehabilitation. At 10th month follow-up, he achieved a knee range of motion of 0–110° with no residual instability or complications.

**Conclusion:** This case highlights the importance of early MRI evaluation in TPFs to detect associated ligamentous injuries. A combined arthroscopic and open surgical approach enables simultaneous restoration of ligamentous stability and articular congruity, leading to favorable functional outcomes even in delayed presentations.

**Keywords:** Tibial plateau fractures, posterior cruciate ligament injuries, knee joint, arthroscopy, internal fixation, ligament reconstruction.

## Author's Photo Gallery



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**Figure 1:** Right knee X-rays showing depressed medial tibial plateau fracture (Schatzker type IV).

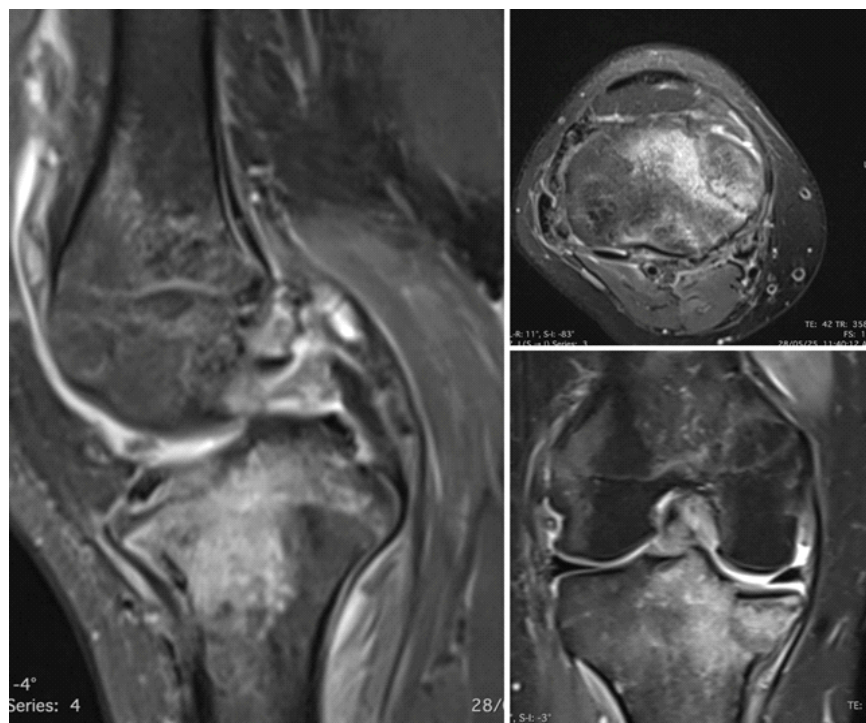
### Introduction

Tibial plateau fractures (TPFs) are intra-articular fractures comprising roughly 1% of all fractures, frequently accompanied by diverse soft-tissue injuries [1,2]. TPFs are generally categorized according to the Schatzker classification system, which delineates fractures into types I through VI. The Schatzker classification method relies on conventional two-dimensional radiological imaging and does not encompass all fracture patterns of TPFs. The “three-column” classification based on computed tomography scanning has been proposed to assist surgeons in comprehending fracture morphology and the mechanism of injury during the traumatic event [3,4]. Closed reduction and internal fixation utilizing a bidirectional fast redactor for TPFs was first articulated by Chang et al. [5] and was considered suitable for Schatzker I–VI fractures, achieving anatomical articular reduction with diminished complication rates. While magnetic resonance imaging (MRI) primarily evaluates intra-articular soft tissue pathology, arthroscopic evaluation provides more specific and accurate insights into cruciate ligament abnormalities, as indicated in numerous prior investigations [6,7]. Nonetheless, arthroscopy is not typically employed for the intraoperative assessment of TPFs due to prolonged surgical duration and the risk of compartment syndrome, despite previous research indicating a reasonably high prevalence of intra-articular soft-tissue

injuries. TPFs affecting the medial condyle represent a minor category of knee injuries and are often linked to instability. The management complexity considerably escalates when accompanied by a posterior cruciate ligament (PCL) damage [8,9]. Prolonged misdiagnosis or insufficient treatment may lead to chronic instability, limited mobility, and premature osteoarthritis. Timely identification and a thorough surgical intervention are crucial for reinstating knee stability and functionality [10]. We present an uncommon instance of TPF accompanied by a high-grade PCL damage, treated with combined arthroscopic reconstruction and osteosynthesis.

### Case Report

An 18-year-old male presented with persistent pain, joint swelling, and restricted knee movements following a high-velocity self-fall from a motorbike. During the time of injury, he had a large right knee effusion and limited range of motion (ROM) due to pain with no associated open injury. Initially, he got native bandaging therapy over three sessions at 15-day intervals. He presented to our institution 45 days post-injury



**Figure 2:** Magnetic resonance imaging of the right knee revealed a high-grade posterior cruciate ligament tear with significant posterior tibial translation.



**Figure 3:** Intra-operative pictures showing posterior cruciate ligament reconstruction and open reduction and internal fixation of the medial tibial plateau through a posteromedial approach using an anatomical locking compression plate.

with ongoing symptoms and difficulty in ambulation. Clinical examination revealed knee effusion, limited ROM, and instability. There were no neurovascular deficits.

### Investigations

Plain radiographs of the right knee demonstrated a depressed medial TPF (Schatzker type IV) with an associated fracture of the fibular head. MRI of the knee revealed a high-grade PCL tear with significant posterior tibial translation, confirming a complex bony and ligamentous injury. Evaluation of the anterior cruciate ligament, collateral ligaments, and menisci showed no apparent damage (Fig. 1 and 2).

### Management

A single-stage combined arthroscopic and osteosynthesis surgical approach was planned. A posterior drawer maneuver under anesthesia confirmed high-grade PCL injury and

diagnostic arthroscopy confirmed a complete PCL tear. Arthroscopic PCL reconstruction was performed using a quadrupled hamstring graft (gracilis and semitendinosus). The final position of the PCL was confirmed to be anatomical and stable. This was followed by open reduction and internal fixation (ORIF) of the medial tibial plateau through a posteromedial approach using an anatomical locking compression plate. A corrective osteotomy was performed to restore medial condylar alignment. The fibular head fracture was managed conservatively due to stable articulation after reduction (Fig. 3).

### Outcome and follow-up

Post-operatively, the patient remained non-weight-bearing with above knee slab. Post-operative right X-ray showed reduced articular step-off and restored posterior tibial slope with implants in situ. Post-operatively, the knee was immobilized in extension with a brace and the patient was kept non-weight-bearing for the first 6 weeks, with gradual passive ROM exercises progressed up to 90° and emphasis on quadriceps strengthening while avoiding hamstring activation to protect the PCL graft. From 6 to 12 weeks, weight-bearing was gradually advanced based on radiological signs of fracture healing, a full ROM was encouraged, and hamstring as well as closed-chain strengthening exercises were initiated. Between 3 and 6 months, progressive strengthening, proprioceptive training, and functional rehabilitation were continued, with return to sports permitted only after confirmation of fracture union and clinical stability.



**Figure 4:** Post-operative right knee X-rays.



**Figure 5:** Post-operatively patient achieved a knee range of motion of 0–100°.

The impact of the 45-day delay before definitive treatment has near to no effect on the patient outcomes, with patient achieving a knee ROM of 0–100°, with no residual instability or joint line tenderness. He was mobilizing with a walker and progressing satisfactorily with physiotherapy. The International Knee Documentation Committee score was recorded as 86 (Fig. 4 and 5). At 10th month follow-up, the patient had knee ROM of 0–110° and the X-ray showed complete fracture healing with implants in situ. The International Knee Documentation Committee score was recorded as 92 (Fig. 6).

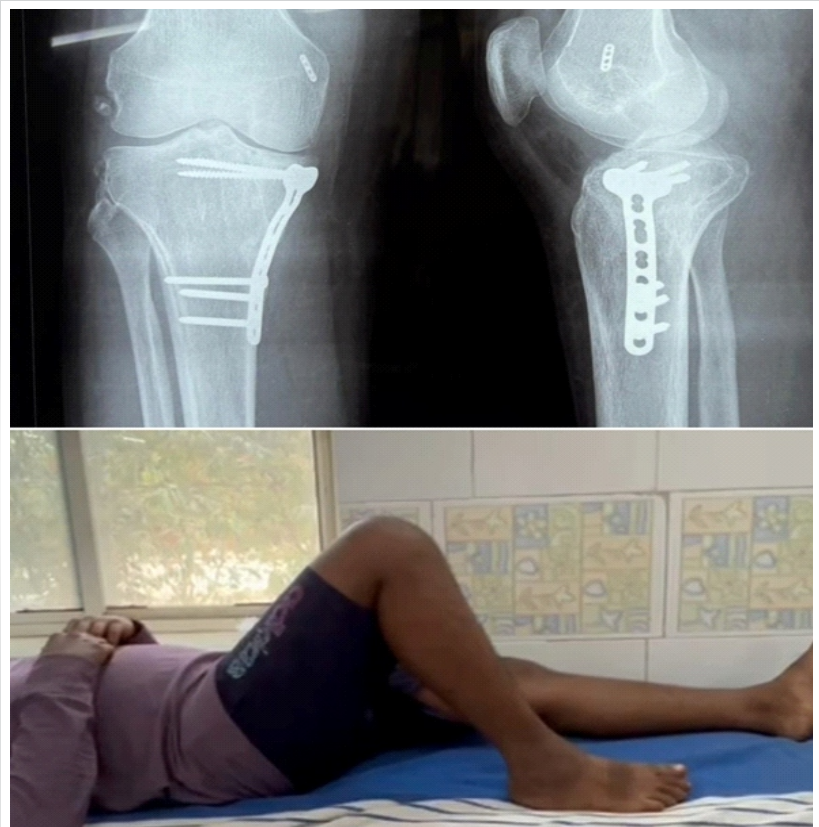
### Discussion

Schatzker type IV fractures typically result from varus axial loading and are commonly associated with occult ligamentous injuries. TPFs associated with PCL injuries represent a complex and frequently underdiagnosed injury pattern, particularly in high-energy trauma among young patients [11]. Delay in definitive orthopedic management, as seen with initial native therapy in this case, increases the risk of long-term joint dysfunction. MRI plays a crucial role in identifying

associated soft-tissue injuries. A combined arthroscopic and open surgical approach allows simultaneous management of ligamentous and bony injuries, leading to optimal functional restoration [12,13].

Arthroscopic evaluation studies have demonstrated a high incidence of occult cruciate and meniscal injuries in TPFs, underscoring the importance of MRI for comprehensive pre-operative assessment. Schatzker type IV (medial plateau) fractures, as seen in the present case, typically result from varus axial loading and are commonly associated with posterior instability due to concomitant ligamentous injury [6].

Previous literature highlights that PCL injuries rarely occur in isolation and are often accompanied by bony injuries involving the tibial plateau or rim. Sai Krishna et al. described posterior tibial rim fractures with PCL avulsion as part of a “diagonal lesion” caused by hyperextension and rotational forces, emphasizing the need for simultaneous treatment of both bony and ligamentous components to restore knee stability. Similarly, Booth et al. reported that combined PCL injury and TPF requires an integrated



**Figure 6:** 10th month follow-up X-ray showing healed fracture with implants in situ and knee flexion of around 110°.

surgical approach to achieve optimal functional outcomes<sup>3</sup> [12,14].

Management strategies reported in the literature include open fixation, arthroscopic fixation, and combined techniques, depending on fracture morphology and ligament involvement. Arthroscopic approaches allow accurate diagnosis and reconstruction of intra-articular soft-tissue injuries, while ORIF ensures anatomical restoration of the articular surface [14,15]. Gunatilake et al. demonstrated that arthroscopic fixation of cruciate ligament injuries combined with stable fixation of TPFs provides good knee stability and functional recovery in complex injury patterns [15].

Delayed presentation or inadequate initial management, such as native therapy, has been associated with chronic instability, stiffness, and early post-traumatic osteoarthritis [6,14]. The favorable early outcome in our patient – with a satisfactory ROM and absence of residual instability – supports existing evidence that single-stage combined arthroscopic PCL reconstruction and osteosynthesis is an effective strategy for managing complex TPFs with ligamentous injury.

Staged management with initial ORIF followed by delayed ligament reconstruction may reduce operative time and soft-tissue complications in acute or polytrauma settings; however, delayed reconstruction risks persistent instability, altered biomechanics, early osteoarthritis, and technically challenging surgery due to scarring, with evidence favoring early restoration of stability. Isolated fracture fixation may be acceptable in low-grade PCL tears, but high-grade injuries rarely regain functional stability without reconstruction, and untreated cruciate deficiency can lead to chronic instability and degeneration despite anatomical articular reduction. Similarly, non-operative management of PCL injuries is suitable only for isolated low-grade tears, as in combined osseoligamentous injuries, it may

result in persistent posterior laxity, abnormal gait, and functional limitation, underscoring the importance of addressing both bony and ligamentous components simultaneously [6,10,11,14].

We acknowledge that the favorable outcome may reflect surgical expertise in arthroscopic PCL reconstruction and complex tibial plateau fixation, potentially limiting reproducibility in less specialized settings. Given the rarity of this injury combination and the nature of a single case report, broad generalization is limited, and our intention is to emphasize diagnostic vigilance and a feasible management strategy rather than establish definitive treatment guidelines. We have incorporated additional literature to better contextualize our findings within existing evidence. Furthermore, the absence of instrumented laxity testing (e.g., KT-1000/KT-2000 arthrometer) and stress radiographs is recognized as a limitation of this report.

### Conclusion

This case highlights the importance of thorough evaluation in complex knee trauma. Early MRI assessment and a combined arthroscopic reconstruction with open osteosynthesis provide stable fixation, restore ligament integrity, and result in excellent short-term functional outcomes, even in delayed presentations.

### Clinical Message

All tibial plateau fractures – especially medial condyle (Schatzker type IV) injuries – should be thoroughly evaluated with MRI to rule out associated cruciate ligament tears, as early identification and single-stage combined arthroscopic ligament reconstruction with stable osteosynthesis can effectively restore knee stability and optimize functional recovery, even in delayed presentations.

**Declaration of patient consent:** The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

**Conflict of interest:** Nil **Source of support:** None

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