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Case report

# Proximal tibiofibular joint dislocation with Maisonneuve fracture and syndesmosis injury: A case report

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**Abstract.** *Background:* Proximal tibiofibular joint dislocation, a seldom-reported injury often overshadowed in polytrauma cases, remains underexplored. This study presents an unusual case featuring a postero-lateral variant of proximal tibiofibular joint dislocation with additional associated lesions. *Case Presentation:* A 66-year-old Italian male, post high-energy car collision, exhibited distinct common peroneal nerve palsy symptoms, revealing an atypical left Maisonneuve fracture with postero-lateral fibular dislocation and tibial mortise diastasis. Surgical intervention, post-stabilization, encompassed exploration and stabilization of the proximal tibiofibular joint and common peroneal nerve. Proximal joint stabilization with 2 cancellous screws and Maisonneuve fracture fixation with a plate followed, along with stabilization of tibial mortise diastasis using a plate and syndesmotic screws. Intra-operative fluoroscopy confirmed anatomical reduction, enabling partial progressive weight-bearing post-transyndesmotic screw removal. *Conclusion:* Surgical intervention yielded positive outcomes, including full weight-bearing, pain relief, and restored nerve function at the 12-month follow-up, emphasizing the necessity of a comprehensive surgical approach for optimal recovery (www.actabiomedica.it)

**Key words:** maisonneuve fracture, tibiofibular joint dislocation, syndesmosis injury, knee pain, ankle injuries

## Introduction

Dislocation of the proximal tibiofibular joint is a rare occurrence, likely underreported in terms of frequency (1). This dislocation may remain undetected, particularly in patients with multiple injuries (2). Despite this, a thorough examination is crucial, given the potential risk of secondary involvement of the common fibular nerve and a syndesmotic injury. We have presented a unique case, not yet reported in the literature to the best of our knowledge with a combination of a postero-lateral variant of proximal tibiofibular joint dislocation with a Maisonneuve fracture and a diastasis of tibial mortise.

## Case presentation

The patient is a 66-year-old Italian male, who presented to our emergency department transported by ambulance, following a high-energy collision, involving a car. The patient presented with a conspicuous fibular head protrusion on the posterolateral aspect of the left knee, accompanied by hematoma and swelling of the left ankle. Neurological examination revealed an acute foot drop, raising suspicion of common peroneal nerve palsy. Additionally, a pubic rami fracture was identified as an associated injury. Anteroposterior and lateral radiographs of the knee, lower leg, and ankle joint acquired in the emergency department revealed


**Figure 1.** Pre-surgery X-rays. 1: Antero-posterior view, 2: Lateral view, 3: Tibial Mortise.

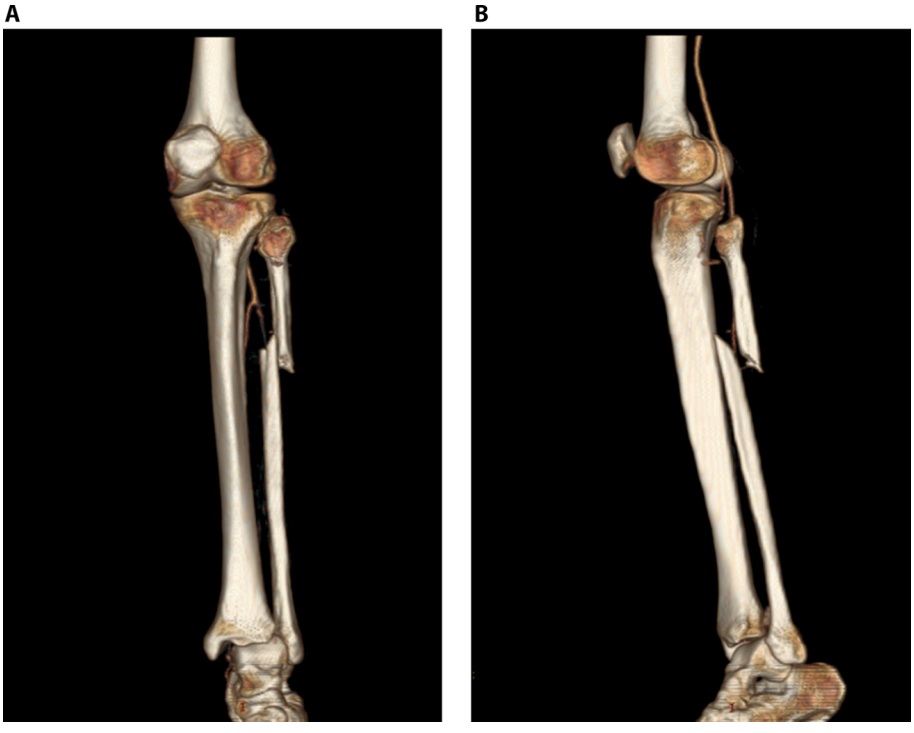


**Figure 2.** Pre-surgery CT 3D Rendering, A: Antero-posterior view, B: Lateral view.

an atypical left Maisonneuve fracture with a postero-lateral dislocation of the proximal fibula and an associate diastasis of the tibial mortise (Figure 1). Increased medial clear space and tibiofibular clear space were also noted and subsequently confirmed by CT examination (Figure 2). Prior to admission to our ward, a spica cast extending above the knee was applied, for temporary stabilization.

Surgical treatment was performed after 5 days, the patient was prepared in supine position in the operating room, under regional anesthesia. A thigh tourniquet was used for hemostasis. First, the proximal tibiofibular joint (PTFJ) was explored, through a 4 cm lateral direct access on the anterior border of the fibular head. Dissection of the common peroneal nerve (CPN) proceeded proximally, identifying the biceps femoris muscle tendon, and extending down to its bifurcation around the fibular head. No interruption of the CPN was observed, but disruption of the PTFJ capsule was noted. Upon identification of an oblique fibular head, temporary fibula reduction was performed using two 2 mm Kirschner wires, followed by joint stabilization using two cancellous screws with washers. Subsequently, capsular repair was undertaken to ensure joint stability. Attention then shifted to addressing the Maisonneuve fracture, necessitating a 4 cm incision over the fracture site. After open reduction with clamps, a semi-tubular plate with seven holes was positioned. A lateral approach was employed then, to explore the distal syndesmosis through a 4 cm incision over the distal part of the fibula. Complete syndesmotic disruption was identified, and the fibula was reduced into the incisura of the tibia to facilitate fracture reduction. Sustained reduction was achieved with a 2-hole plate and 3.5 mm quadricortical syndesmotic screws (Figure 3). Intra-operative fluoroscopy confirmed anatomical reduction of the treated joints and ensured perfect stability with dorsiflexion and external rotation.

Following the surgical procedure, a post-operative CT scan was conducted to evaluate the reduction of both joints. Additionally, magnetic resonance images confirmed the successful reduction of the PTFJ. Immediate passive mobilization of the knee and ankle was permitted, with strictly enforced non-weight bearing for the initial 6 weeks. A Codivilla spring, prescribed alongside a neurotrophic drug, was employed to address the acute foot drop. Partial progressive weight bearing was initiated after the removal of the two transyndesmotic screws. During the mid-follow-up at 4 months post-surgery, the Codivilla spring was removed. At the conclusive clinical and radiographic follow-up, conducted 12 months post-surgery, the patient exhibited full weight-bearing capability without assistance, and reported an absence of pain. Resolution of the common peroneal nerve palsy was evident.


**Figure 3.** After surgery X-ray: A-B lateral view, C antero-posterior view.

The patient's American Orthopaedic Foot and Ankle Society Hindfoot-Ankle Scale score reached 100 out of 100. No tenderness was observed upon palpation at the site of the previous fracture. Full range of motion in the knee was achieved, matching that of the unaffected right knee. The resumption of everyday activities and participation in sports was successfully attained. The patient has provided informed consent for the publication of this case report, including the anonymized images.

## Discussion

Proximal tibiofibular dislocation is a rare injury typically associated with other traumatic lesions, including neurovascular, osseous, or ligamentous injuries (3). It commonly occurs during sports activities or high-energy trauma, with the knee in flexion and the lateral collateral ligament relaxed. The proximal tibiofibular joint exhibits greater stability when the knee is extended, as the fibular head is pulled posteriorly due to the tightening of the lateral collateral ligament and the biceps femoris tendon. Conversely, during knee flexion, the fibular head migrates anteriorly due to the relaxation of the lateral collateral ligament and the biceps femoris tendon, rendering the proximal tibiofibular joint more susceptible to injury (4). An additional factor linked to proximal tibiofibular dislocation is the anatomic variation of the fibular head, categorized as the horizontal type and the oblique type (5). The oblique type, associated with less rotatory mobility, is more vulnerable to rotational forces due to a smaller joint surface area, as indicated by Espregueria et al. (6), a configuration observed in our patient. To date, only two classifications of proximal tibiofibular dislocation are described in the literature. The first, from 1925 by Lyle et al (7), and the second, the Ogden classification, is the most recurrent, encompassing four different types of dislocation: subluxation (type I), anterolateral dislocation (type II), posteromedial dislocation (type III), and superior dislocation (type IV) (8). Notably, the literature also reports another dislocation type, the inferior, as described by Gabrion et al (9). Anterolateral dislocation is the most frequently occurring type, accounting for 85% of all cases (10). Various treatment options and indications for proximal tibiofibular joint instability have been presented in case series with short-term follow-up, with a systematic review by Kruckeberg et al being one notable exception (10). Closed reduction and immobilization for 1 to 6 weeks represent the conservative first-line treatment. The reduction maneuver involves applying direct pressure over the fibular head with the knee flexed 90-110° (11). Surgical intervention is recommended if persistent instability follows nonoperative treatment, irrespective of the dislocation direction, as persistent instability could lead to reduced knee function, diminished quality of life, or common peroneal injury (12, 4, 10, 13-15). Satisfactory outcomes after intervention are generally reported, with a variety of surgical approaches described, including fibular head resection (16-17, 8, 10), open reduction with permanent or temporary fixation (18-19, 10), cortical suspensory devices (20-21), and proximal tibiofibular joint ligament reconstruction (10). Internal fixation options include Kirschner wires, bioabsorbable pins, or cancellous screws. In our case, open reduction was performed to explore the proximal tibiofibular joint, reduce the dislocation, and identify the common peroneal nerve. Subsequently, internal fixation using two cancellous screws was carried out to perform an arthrodesis, following the technique proposed by Baciu et al (22). Notably, literature suggests that proximal tibiofibular joint arthrodesis may predispose the tibiotalar joint to increased pain and instability (5, 8); however, we did not observe such complications in our patient during subsequent follow-ups. The second phase of treatment involved addressing the syndesmotic injury. Current understanding emphasizes the necessity of proper fixation in documented syndesmotic injuries (23, 3-4). Various techniques are described, with anatomic restoration of the mortise deemed essential to prevent chronic diastasis, widening, and instability, which correlate with poor functional outcomes and the development of osteoarthritis (24, 3). Optimal syndesmotic screw placement is suggested to be 2 to 4 cm proximal to the tibiotalar joint, angled 30 anteriorly, particularly for high fibular fractures (25). In our case, the technique proposed by Jung et al was employed (26, 3), utilizing a plate and screw construct to evenly distribute forces across the syndesmosis and provide greater

compression compared to the use of two screws alone, as described by Bissuel et al. Finally, the upper third fibula fracture, often not requiring direct stabilization in a Maisonneuve injury, was addressed. While open reduction and fixation are generally contraindicated due to the risk of intraoperative peroneal nerve injury (23), we stabilized the upper third fibula fracture using a 7-hole plate and cortical screw, considering the high instability of the lesion. This additional intervention proved successful in achieving the comprehensive recovery of the patient.

## Conclusion

In the existing literature, posterolateral dislocations of the fibula have been documented only twice before our experience. Sreesobh et al. reported a posterolateral dislocation of the proximal tibiofibular joint (PTFJ) with an intact fibula in the context of a tibial shaft open fracture. In this case, the common peroneal nerve was contiguous but stretched over the neck of the fibula. Unfortunately, no follow-up was conducted, precluding a determination of the transitory or permanent nature of the nerve injury (27,28). Zeiton et al. detailed a variant of Bosworth fracture-dislocation injury featuring a posterolateral dislocation of the fibula (29). In our case, posterolateral dislocation of the proximal fibula was concomitant with a proximal fibula fracture, an open tibial mortise and transient common peroneal nerve palsy. At the 12-month follow-up, the patient demonstrated full weight-bearing capability without assistance and reported an absence of pain. The resolution of common peroneal nerve palsy was evident, culminating in a complete recovery.

In conclusion, to the best of our knowledge, this represents the inaugural instance of a posterolateral dislocation of the PTFJ associated with a Maisonneuve fracture and an open tibial mortise. Our case highlights the efficacy of surgical stabilization for the comprehensive management of all associated lesions, resulting in favorable outcomes.

**Ethic Approval:** Informed consent for publication was obtained from the patient, and this report was conducted in compliance with the tenets of the Declaration of Helsinki

**Conflict of Interest:** Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

**Authors Contribution:** Conceptualisation, G.P.; methodology, F.P.; software, R.O.; validation, G.S.;formal analysis, M.G.; investigation, M.S.; resources, G.P.; data curation, G.L.; writing—original draft preparation, G.P.; writing—review and editing, M.G.; visualisation, G.S.; supervision, G.P.; project administration, G.P.; All authors have read and agreed to the published version of the manuscript.

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