

Traumatic Dislocations of the Proximal Tibiofibular Associated with Tibial Fractures: Challenges in Diagnosis and Management

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Abstract

Approximately 1-2% of tibial fractures are associated with traumatic dislocations of the proximal tibiofibular joint. The associated injury pattern is frequently the result of a severe high-energy injury. Establishing the diagnosis of a proximal tibiofibular dislocation is frequently complicated by the fairly subtle clinical and radiographic presentation of this injury. Computer tomography scans of the knee should be considered for proper evaluation. Surgical treatment should consist of proper fixation of the tibial fracture followed by open reduction and internal fixation of the dislocated proximal tibiofibular joint. Multiple fixation options exist including screw, K-wire, and suture fixation constructs.

Keywords: Tibia; Trauma; Fracture; Proximal tibiofibular dislocation

Introduction

Traumatic dislocations of the proximal tibiofibular joint in association with tibial fractures have received limited attention in the literature and in orthopaedic textbooks. As of today, recommendations from the literature are mostly based on case reports [1-4] or case series with relatively small numbers [5,6]. It has been reported that approximately 1-2% of tibial plateau and shaft fractures undergoing surgical fixation are associated with a traumatic dislocation of the proximal tibiofibular joint [6]. However, it must be assumed that the injury may frequently go unrecognized due to its rarity, physician's unfamiliarity with the injury, the relatively subtle clinical and radiographic findings, and the physician's focus on the more obvious tibial fracture [1,3,4,7]. Therefore, the goal of this article is to review the anatomy, epidemiology, diagnosis, and treatment of traumatic proximal tibiofibular dislocations associated with tibial fractures.

Case Example

A 21-year-old male presented to our level 1 trauma center after a motor vehicle accident. He was intubated on scene. He was evaluated according to Advanced Trauma Life Support (ATLS) guidelines and was found to have multiple injuries including an intraparenchymal hemorrhage, bifrontal contusions, adrenal hemorrhage, sternal fracture,



and multiple rib fractures. In addition, his orthopedic injuries included a partial amputation of his left wrist with multiple tendon and ligament lacerations and an open left proximal tibia fracture (Figures 1A and 1B). Due to clinical suspicion for a vascular lower extremity injury, a CT angiography was performed which was negative for associated lower extremity vascular injuries.

Following successful resuscitation in the trauma bay, he was taken directly to the operating room by the orthopedic trauma team for irrigation and debridement and intramedullary nail fixation of his open tibial fracture. A six-hole 1/3 tubular unicortical plate was placed through the traumatic wound in order to assist in the reduction. The hand injury was simultaneously managed by the plastic surgery service. The postoperative plain radiographs indicated increased distance



Figures 1A and 1B: Antero-posterior (Figure 1A) and lateral (Figure 1B) radiograph of proximal tibia fracture.

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between the proximal tibia and fibular head concerning for a traumatic dislocation of the proximal tibiofibular joint (Figures 2A and 2B). In addition, the CT angiogram was thoroughly reviewed and the proximal tibiofibular dislocation was indeed visible on the axial cuts (Figure 3). Subsequently, a Magnetic Resonance Imaging (MRI) of the left knee was obtained which showed partial tears of the anterior and posterior cruciate ligaments, a sprain of the medial collateral ligament and a disruption of the popliteus tendon. Based on these data, the decision was made to return to the operating room in order to address the

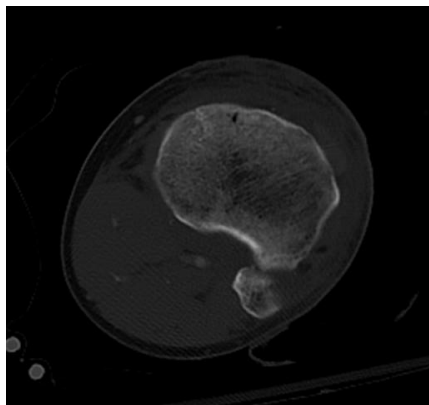
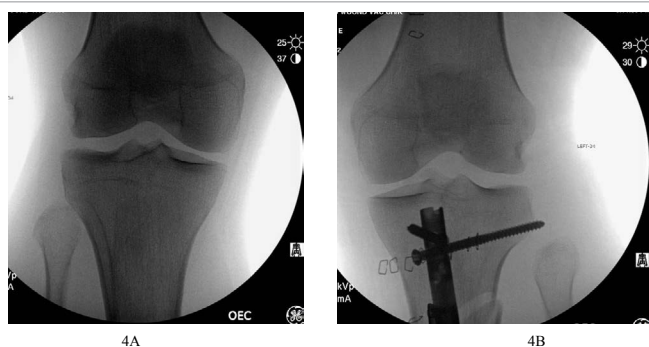


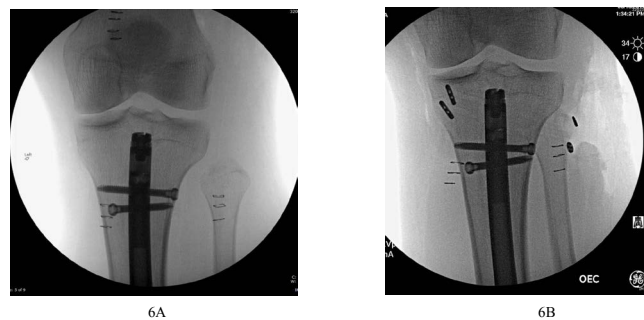
Figure 3: Dislocation of proximal tibiofibular joint depicted on axial CT scans.



Figures 4A and 4B: Fluoroscopic views of uninjured contralateral knee (Figure 4A) as compared with the injured side (Figure 4B). Significant disruption of the left proximal tibiofibular joint appreciated (Figure 4B).



Figures 5A and 5B: Antero-posterior (Figure 5A) and lateral (Figure 5B) radiographs of proximal tibia following open reduction and internal screw fixation of proximal tibiofibular joint.



Figures 6A and 6B: Fluoroscopic views of tibia during nailing procedure depicting the dislocation of the proximal tibiofibular joint (Figure 6A). Injury addressed by open reduction and tightrope fixation (TightRope®)Arthrex, Naples, FL, USA) (Figure 6B).

proximal tibiofibular joint disruption. Prior to the surgical procedure, standardized fluoroscopic images further documented the significant disruption of the proximal tibiofibular joint (Figures 4A and 4B). An open reduction and internal fixation of the left proximal tibiofibular dislocation, using a 3.5 mm cortical screw, was then performed (Figures 5A and 5B). Postoperatively, the injured knee was placed into a hinged knee brace locked in extension and the patient was made non-weight bearing to his left lower extremity. At his three-week follow-up visit, the patient was encouraged to initiate range of motion exercises to the left knee. At six weeks, he was able to range the left knee from 0 to 80 degrees with minimal pain.

Current Concepts

The proximal tibiofibular joint is a synovial articulation between the proximal fibula head and the lateral condyle [7,8]. The main stabilizers are the anterosuperior and posterosuperior tibiofibular ligaments which represent thickening of the joint capsule [8]. Additional stabilizers include the lateral collateral ligament, biceps femoris, popliteal tendon, arcuate ligament, fabellofibular ligament, and the popliteofibular ligament. The proximal tibiofibular joint is most stable with the knee extended. Treating physicians must also be aware of the close proximity of the peroneal nerve which is running immediately posterior to the fibula head.

The exact incidence of proximal tibiofibular dislocations in association with tibial plateau and shaft fractures remains unknown. It must be assumed that a certain number of these injuries go undiagnosed. Moreover, due to the rarity of this associated injury, larger case series in this field are limited. To our best knowledge, the largest case series in this field has been published by Herzog et al. [6]. These authors reported on 30 patients with a proximal tibiofibular dislocation associated with tibial plateau and/or shaft fractures. They estimated that approximately 1-2% of tibial fractures are associated with a dislocation of the proximal tibiofibular joint. However, the authors acknowledged that their series potentially underestimated the true incidence. The associated injury pattern was found to be the result of severe lower extremity trauma with a high rate of compartment syndrome (29%), open fracture (63%), and peroneal nerve palsy (36%). In particular, the peroneal nerve palsies had a poor prognosis with 70% of patients showing no signs of recovery [6].

It has been suggested that the diagnosis of proximal tibiofibular dislocations may be established by a thorough history and physical examination [7,8]. However, these recommendations are mostly related to isolated proximal tibiofibular dislocations. In patients with high-energy injuries tibial plateau and shaft fractures, the clinical data points

may be obscured by the patient's obtunded status from associated injuries and the overlying pathology from the associated tibial fracture. Therefore, appropriate radiographic studies are crucial for establishing the diagnosis. It has been reported that standard plain antero-posterior and lateral radiographs are frequently insufficient in diagnosing the injury [9]. While contralateral comparison views have been shown to be useful, it has been reported that axial computer tomography (CT) scans provide the highest accuracy and should be considered the investigation of choice [9]. The use of Magnetic Resonance Imaging (MRI) has been suggested in reference to isolated proximal tibiofibular dislocations [8]. The benefit of the MRI lies in its ability to provide detailed information on the associated ligament injury which may facilitate the planning of any required ligamentous reconstruction.

The treatment of traumatic proximal tibiofibular dislocations associated with tibial fractures should include early reduction and stabilization of the proximal tibiofibular joint in order to avoid significant morbidity arising from chronic instability. Surgical fixation of the associated tibial fracture should precede the surgical stabilization of the proximal tibiofibular joint dislocation. Thus, anatomic reduction of the underlying tibial fracture will facilitate the reduction of the associated joint dislocation. Moreover, stable fixation of the tibial fracture will provide a stable base for surgical fixation of the proximal tibiofibular joint. An open approach is typically required in order to achieve an accurate reduction of the proximal tibiofibular joint under direct visualization. The peroneal nerve running posteriorly to the fibula head needs to be visualized and thoroughly protected throughout the surgical procedure. With regards to the surgical fixation, the authors recommend a screw fixation construct in order to provide appropriate stabilization. But also, K-wire fixation constructs have been suggested in the literature [4]. Recently, tightrope fixation (TightRope®) Arthrex, Naples, FL, USA) has also evolved as a feasible alternative fixation method (Figures 6A and 6B). However, there is no consensus on the type of surgical fixation for traumatic proximal tibiofibular dislocations. Postoperatively, we recommend immobilization with a hinged knee brace locked in extension for 3 weeks in order to protect the surgical repair.

Conclusions

Tibial fractures are associated with proximal tibiofibular joint

dislocations in approximately 1-2% of the cases. This associated injury pattern is frequently the result of a severe high-energy injury to the lower extremity. Proximal tibiofibular dislocations may frequently be missed or diagnosed in a delayed fashion. Dedicated imaging studies are required in order to appropriately diagnose the injury. Recently, routine CT scans have been recommended for distal third tibial shaft fractures due to the high co-occurrence of associated ankle fractures [10]. Similarly, we suggest considering CT scans of the knee when there is a suspicion for a proximal tibiofibular dislocation. Open reduction and internal screw fixation remains our preferred treatment choice for traumatic proximal tibiofibular dislocations associated with tibial fractures.

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