

Dislocation of the Proximal Tibiofibular Joint in Association With a Tibial Shaft Fracture: Two Case Reports and a Literature Review

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ABSTRACT

Dislocation of the proximal tibiofibular joint (PTFJ) in association with a displaced tibial shaft fracture and an intact fibula is an exceedingly rare injury. We present 2 cases of tibia fractures associated with an intact fibula and a PTFJ dislocation. The first case involves a man who sustained a closed spiral fracture of the distal tibial shaft, with an intact fibula, an anterolaterally dislocated PTFJ, and a partial tear of the lateral collateral ligament. The tibia was percutaneously plated, and the PTFJ was reduced and then stabilized with temporary screw fixation. The second case involves a woman who sustained a closed fracture of the tibia in association with a PTFJ dislocation. The tibia was fixed with an intramedullary nail, and the PTFJ was similarly reduced and fixed with a temporary screw. We also provide a brief literature review focusing on classification of PTFJ dislocations, mechanism of injury, associated injuries, and treatment options.

These cases underscore the need to assess the PTFJ in the setting of a displaced tibial shaft fracture in the presence of an intact fibula.

fibular joint (PTFJ) (Figures 1A, 1B). He was also noted to have a nondisplaced fracture of the contralateral right medial malleolus. Radiographs

“...assess the PTFJ in the setting of a displaced tibial shaft fracture in the presence of an intact fibula”

CASE 1

A man in his late 20s jumped onto a moving truck but fell off and was then struck by a car. He presented to the emergency department via emergency services and was noted to be hypotensive and had clinical deformity present in both lower extremities. His injuries were closed and he was noted to have an intact neurovascular examination.

Plain radiographs revealed a displaced spiral fracture of the left distal tibial diaphysis and were suggestive of a dislocation of the proximal tibio-

and computed tomography (CT) scan of the pelvis showed mild diastasis of the pubic symphysis and left sacroiliac joint without associated fracture and a laceration of the prostatic urethra.

After resuscitation and stabilization, the patient was brought to the operating room, and an exam under anesthesia was performed on the pelvis. The pelvic ring was stable and was treated closed. The right medial malleolus fracture was stabilized percutaneously with 2 short-threaded can-

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Figure 1. (A) Anteroposterior and (B) lateral plain films obtained in the emergency department illustrate displaced spiral distal tibial shaft fracture with intact fibula.

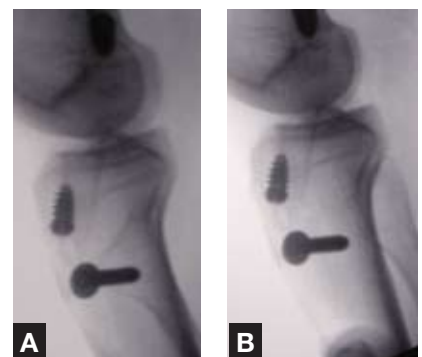


Figure 2. Intraoperative x-rays illustrate instability of proximal tibiofibular joint: (A) Lateral x-ray with gentle pressure on the fibula shows anterior instability; (B) with release of pressure, the fibula reduces to its anatomic position.

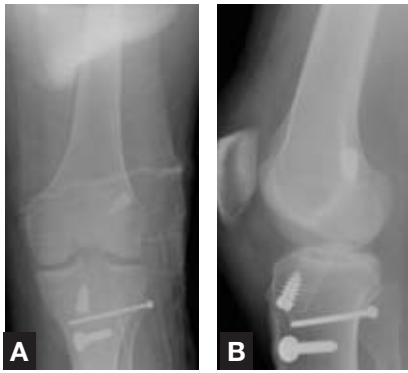


Figure 3. Postoperative anteroposterior (A) and lateral (B) x-rays show reduction and fixation of proximal tibiofibular joint.



Figure 4. Anteroposterior (A) and lateral (B) x-rays show displaced tibial shaft fracture with intact fibula.

nulated lag screws. The left distal tibial shaft fracture was reduced and internally fixed with a 12-hole peri-articular distal tibial plate inserted percutaneously. The left knee was then examined under anesthesia. During simple flexion/extension of the knee, the PTFJ was grossly unstable. The fibula dislocated anterolaterally with flexion of the knee and light anterior pressure on the fibular head (Figures 2A, 2B). After achieving fluoroscopically confirmed closed reduction, percutaneous screw fixation of the PTFJ was performed. (Figures 3A, 3B). Subsequent magnetic resonance imaging scan of the left knee showed a partial tear of the lateral collateral ligament at its origin; however, the knee was clinically stable to varus stress and this was treated with the short-term use of a hinged orthosis.

CASE 2

A woman in her early 40s presented to the emergency department via emer-

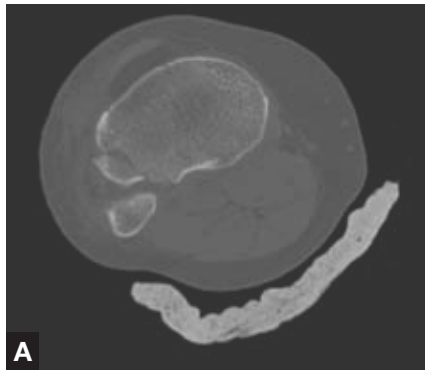


Figure 5. Computed tomography scans show displacement of proximal fibula, associated with avulsion fracture of the proximal tibial plateau: (A) Axial scan shows avulsion of proximal tibia with posterolateral subluxation of proximal fibula, and (B) sagittal scan shows avulsion of proximal tibia.



Figure 6. Intraoperative lateral x-rays show instability at proximal tibiofibular joint (PTFJ) after fixation of tibia fracture: (A) posterior displacement of fibula relative to tibia; (B) with gentle pressure applied to fibular head, PTFJ is reduced.

gency services after being struck by a motor vehicle while crossing the street. She had an isolated complaint of right leg pain. She was noted to have a crepitant unstable mid-tibial injury, which was closed. She also localized pain to the region of the PTFJ.

Plain x-rays revealed a displaced midshaft tibia fracture with a small non-displaced wedge butterfly in association with an intact fibula (Figures 4A, 4B). X-ray and CT scan of the knee revealed, proximally, a small posterolateral rim fracture adjacent to the PTFJ (Figures 5A, 5B). Apparently, with shortening and angulation through the tibia fracture, energy was transmitted to the PTFJ, causing a marginal fracture of the tibia with some displacement and a relative prominence of the fibula proximally.

After intramedullary nailing of the tibia fracture, the knee was examined clinically and fluoroscopically. There was a definite and reproducible insta-

bility at the PTFJ (Figures 6A, 6B). Getting the tibia out to length and into alignment appeared to indirectly improve displacement of the small rim fracture of the posterolateral tibia. However, there was significant posterior subluxation of the fibula. Statically, the joint appeared to be subluxed posterolaterally; it was reduced fluoroscopically by applying minimal pressure on the fibular head and by flexing the knee over a towel bump placed under the fibula. Given the instability, the joint was fixed with a percutaneously placed 3.5-mm screw with washer (Figures 7A, 7B).

DISCUSSION

The PTFJ is a synovial joint. The joint capsule is reinforced by the anterior and posterior proximal tibiofibular ligaments. The posterolateral structures of the knee (primarily the lateral collateral ligament, arcuate ligament, and popliteus tendon but also the fabellofibular ligament and

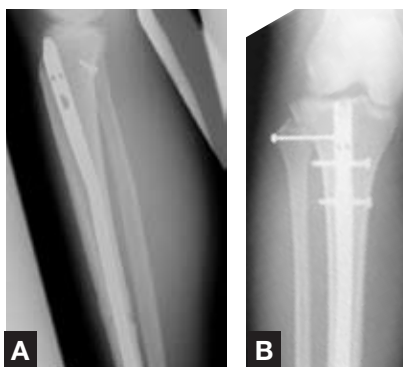


Figure 7. Postoperative anteroposterior (A) and lateral (B) x-rays show reduction and stabilization of proximal tibiofibular joint with temporary screw and washer. Also shown are reduction and fixation of the tibial shaft fracture.

popliteofibular ligament) also help stabilize the joint. The biceps femoris tendon limits anterior motion of the fibular head. The lateral collateral ligament supports the joint superiorly. With knee flexion, the lateral collateral ligament and biceps femoris tendon relax, allowing the proximal fibula to move anteriorly. As a result of the laxity in the joint capsule with flexion and the relative weakness of the posterior supporting structures, dislocations of the PTFJ are usually anterior and occur with the knee in a flexed position.

The literature on PTFJ injuries has been focused on isolated injuries of the PTFJ. These injuries are associated with violent twisting motions of the flexed knee. Ogden¹ described 4 types of PTFJ instability. Subluxations of the joint are seen most commonly in children, who typically have no history of trauma and frequently exhibit generalized ligamentous laxity.² Anterolateral dislocation is the most common. The mechanism of injury is adduction of the lower leg with the knee flexed; in this position, the biceps femoris tendon and lateral collateral ligament are relaxed. Sudden inversion and plantar flexion of the foot with external rotation of the tibia pull the tibia forward, given the tension on the peroneal and extensor muscle groups.³ In the present case 1, a spiral fracture of the tibia resulted as well. Anterolateral dislocation involves injury to the anterior and posterior capsular ligaments and is associated with lateral collateral ligament injury,⁴ as was seen in this case.

Posteromedial dislocation results from a twisting injury that tears the capsule and lateral collateral ligament—either a violent contraction of the biceps femoris, which pulls the loosened head of the fibula posteriorly, or a direct blow to the fibular head. Posteromedial dislocation is associated with peroneal nerve injury.⁵ Superior dislocation involves injury to the interosseous membrane between the tibia and fibula and is associated with a high-energy ankle injury, a displaced tibial shaft fracture, and superior migration of an intact fibula.^{6,7}

An internal-rotation x-ray at 45° to 60° is the optimal view for visualizing the PTFJ.⁴ The medial aspect of the fibular head crosses the lateral border of the tibia. On the lateral x-ray, the fibular head overlies the posterior border of the tibia. An important landmark on the lateral x-ray is a radiodense line formed by part of the posteromedial area of the lateral tibial condyle. Normally, the fibular head bisects this line. However, the fibular head will be anterior or posterior to this line in an anterior or posterior dislocation, respectively.

Management of atraumatic PTFJ subluxation is nonsurgical: immobilization in a cylinder cast for 2 to 3 weeks, followed by use of a supportive strap placed below the fibular head.⁸ Initial management of acute anterolateral PTFJ dislocations should be by closed reduction, which may be achieved by posterior pressure on the fibular head with the knee flexed 90° and the foot externally rotated, everted, and dorsiflexed.⁵ Subsequent immobilization is controversial.^{1,3,9} When closed reduction fails, open reduction should be performed, and the joint should be stabilized with temporary screw fixation or Kirschner wires, combined with a primary repair of the torn capsule and injured ligaments.^{5,9,10} Acute posteromedial or superior dislocations are indications for surgery. Several techniques have been used to treat recurrent symptoms, including arthrodesis,¹¹ fibular head resection,^{1,12,13} and repair of the capsule using a strip of biceps femoris tendon and deep fascia of the anterior compartment of the leg.¹⁴

Displaced tibial fractures are commonly associated with a fracture of the fibula. However, in cases of high-energy displaced tibial fractures in association with an intact fibula, one should specifically assess for PTFJ injury after tibial fixation is achieved. Injury to the PTFJ may present as either instability or frank dislocation. The type of PTFJ dislocation should also alert the treating surgeon to associated injuries, such as lateral collateral ligament injury with anterolateral dislocations, or peroneal nerve injuries with posteromedial dislocations.

AUTHORS' DISCLOSURE STATEMENT AND ACKNOWLEDGMENT

The authors report no actual or potential conflict of interest in relation to this article.

The investigation reported in this article was conducted in the Department of Orthopaedic Surgery, Northwestern University Feinberg School of Medicine, Chicago, Illinois.

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