

Open posterior dislocation of the knee with rupture of the patellar tendon and a tibial plateau fracture

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Abstract

Knee dislocations are rare injuries. They represent a severe soft tissue injury following high-energy blunt trauma. We report a case of open posterior knee dislocation with rupture of the patellar tendon and a fracture of the tibial plateau. The treatment was surgical and consisted of reduction of the knee dislocation, fixation of the tibial plateau fracture by lag screws, and transosseous sutures for the patellar tendon protected by a patellofibular cerclage. The result was successful with full range of motion.

Introduction

Knee dislocations are uncommon injuries with a wide variety of presentations and treatment options. They are caused by violent trauma. Damage to soft tissues and ligament lesions almost always accompany the injury. Vascular compromise further complicates the situation. We report an unusual combination of open posterior knee dislocation, rupture of the patellar tendon, and fracture of the tibial plateau. As far as we are aware, no case associated with knee dislocation, rupture of the patellar tendon, and fracture of the tibial plateau has been reported previously in the literature. The following might be the first such case.

Case Report

A 40-year-old male motorcyclist had a road traffic accident. He was riding a motorbike in the countryside and was hit by a car. He presented in the emergency department with pain in the right knee. The vital signs were stable. Physical examination revealed an anterior skin wound with marked deformity of the right knee (Figure 1A). No distal neurovascular deficit was recorded in the injured extremity (popliteal and ankle pulses were detected).

Initial radiographs showed a posterior dislocation of the knee, with the patella staying at the level of the femoral condyles, a comminuted fracture of the tibial tuberosity, and a split depression fracture of the lateral plateau, type B3 according to AO classification (Figure 1B and C). No magnetic resonance imaging (MRI) of the knee was performed. The patient was taken to the operating room, where the knee dislocation was reduced under regional anesthesia. After debridement, the exploration of the right knee found a rupture of the patellar tendon from its tibial insertion, with a comminuted fracture of the tibial tuberosity, and a split depression of the lateral plateau. The fixation of the lateral plateau fracture was accomplished with two lag screws inserted under radiographic guidance, and the patellar tendon was repaired and reattached to the tibial tuberosity by transosseous sutures and protected by a patellofibular cerclage (Figure 2). Postoperatively, a posterior plaster splint was applied with the knee in 15° of flexion. The patient was instructed to do quadriceps strengthening exercises. The plaster splint was removed at six weeks after surgery, and knee mobilization was started. The range of motion gradually increased. Two weeks afterward, the patient was able to extend the knee actively from 80° of flexion. At this time, the patellofibular cerclage was removed (Figure 3), and knee mobilization under general anesthesia was accomplished; 120° of flexion was achieved by the end of the knee mobilization. The knee was stable, with integrity of all knee ligaments. Then the patient was sent for physical therapy. He returned two years after surgery. He was satisfied, able to walk without a limp, had gained full range of knee motion (Figure 4), and was back at work.

Discussion

Knee dislocations are uncommon, representing less than 0.2% of all orthopedic injuries.¹ They represent a severe soft tissue injury following high-energy blunt trauma. In 1963, Kennedy classified knee dislocations in terms of the tibial position with respect to the femur.² He noted five main types of dislocations: anterior, posterior, lateral, medial, and rotatory. Rotatory dislocations are further subclassified into anteromedial, anterolateral, posteromedial, and posterolateral. This classification system has been used frequently. Schenck³ described the anatomical classification of knee dislocation. The classification was modified by Wascher⁴ and is based on the injured structures. Knee dislocation I represents a posterior cruciate ligament intact dislocation. Knee dislocation II is a bicruciate injury with the corner intact. Knee dislocation III is a

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bicruciate injury with either the posteromedial or the posterolateral corner intact and the other torn. Knee dislocation IV is an injury to both cruciate ligaments as well as both their corners. Knee dislocation V is a knee dislocation associated with a periarticular fracture. Our case is unclassifiable according to the modified Schenck's classification. Subgroups defining status of the patellar tendon and combination of injuries may be added to the classification.

The majority of the literature supports the observation that anterior knee dislocations are the most common, usually resulting from a hyperextension mechanism.^{2,5,6} Posterior dislocations are the second most common, and are caused by direct application of a posterior force to the anterior tibia.⁵ The anterior blow to the tibia can occur while the foot is fixed on the ground during contact sport, or by abrupt deceleration and dashboard strike to the anterior tibia with the knee in a flexed position during a motor vehicle collision.^{6,7} The posterior cruciate ligament (PCL) is key to posterior stability and is always ruptured in posterior dislocations. In the classic cadaver study by Kennedy,² application of extreme posterior loads to the anterior tibia was required to rupture the PCL. Posterior dislocation could be produced in 2/12 knees only and concomitant disruption of the patella tendon occurred in both. The anterior cruciate ligament (ACL) is also commonly injured during posterior knee dislocations, but has been reported as intact in some instances.⁸

In association with high-energy trauma, fractures of the distal femur or tibial plateau and damage to the common peroneal nerve can



Figure 1. (A) Anterior skin wound with marked deformity of the right knee. (B,C) Preoperative anteroposterior (B) and lateral (C) radiographs showing posterior dislocation of the knee with the patella staying at the level of the femoral condyles, a comminuted fracture of the tibial tubercle, and a split depression fracture of the lateral plateau.

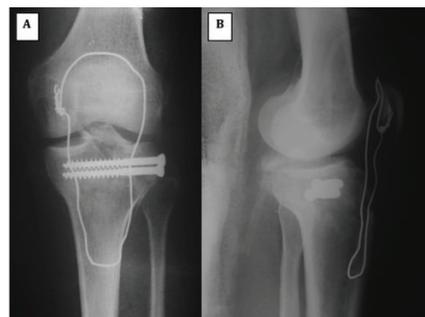


Figure 2. Postoperative anteroposterior (A) and lateral (B) radiographs showing fixation of the tibial plateau fracture by lag screws and patellotibial cerclage.

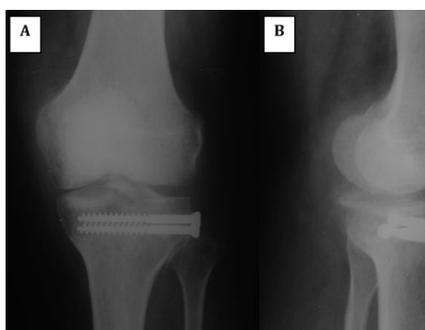


Figure 3. Anteroposterior (A) and lateral (B) radiographs after removing the patellotibial cerclage (two months after the initial operation).

occur. Fractures of either the distal femur or proximal tibia are reported to occur in between 4.5% and 34% of cases of knee dislocation.⁹⁻¹² Anteromedial tibial plateau fractures in partic-



Figure 4. Final aspect with full range of knee motion.

ular are associated with disruption of the PCL and posterolateral ligament complex (PLC). A knee dislocation associated with patellar tendon rupture and lateral plateau fracture has not been reported before. Such an injury complex requires extremely severe trauma.

Owing to the rarity of knee dislocations, there are few studies addressing the treatment modalities of this injury. Strategies for the management of knee dislocation are varied and controversial. Taylor *et al.*,⁷ Mitchell,¹³ and Thomsen *et al.*¹⁴ published studies favoring the nonsurgical approach, while more recent studies have favored operative treatment. The current trend is toward earlier reconstruction for ligamentous injuries.^{9,15-17} It is difficult to reconcile the difference in opinion between those who advocate closed reduction without ligamentous repair and those who recommend early operative repair of all damaged structures. If there is an accompanying rupture of the patellar tendon, surgical intervention is inevitable, thus ligament repair should be carried out simultaneously. Timing of the surgery depends on the vascular status of the extremity. Knee ligament reconstruction procedures can be performed electively, as required. With untreated patellar tendon ruptures, the extensor mechanism can contract so that it is difficult to position the patella distally for repair. The possibility of patellar tendon rupture should be remembered in all cases with complete posterior dislocation of the knee.

Conclusions

A combination of open posterior knee dislocation, rupture of the patellar tendon, and a fracture of the tibial plateau is an uncommon injury. There are various clinical signs and radiographic features that are useful in aiding diagnosis. Initiating appropriate treatment early will help improve the functional outcome of the injured extremity.

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