

FRACTURE OF THE MEDIAL TIBIAL PLATEAU WITH CONCOMITANT AVULSION FRACTURE OF THE FIBULAR HEAD

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Abstract

Fractures of the medial tibial plateau accompanied by avulsion fracture of the head of the fibula are complex injuries that require careful evaluation and management. This type of injury is commonly observed in high-energy trauma, such as motor vehicle accidents or sports-related incidents. A common injury mechanism for this type of injury is axial compression with varus loading stress, which causes axial loading on the medial tibial plateau and at the same time strain stress in the lateral structures of the knee. Herein, we present a case of a 51-year-old male patient with medial tibial plateau fracture associated with avulsion fracture of the fibular head. This case presents our approach to the diagnosis and treatment of this particularly complex injury. Fractures of the medial tibial plateau with concomitant avulsion fracture of the fibular head are complex injuries that require meticulous approach. The key to success is accurate diagnostics, recognizing the problem and treating each problem accordingly. The goal is anatomical reduction and absolute stability which will allow early motion and mobilization.

Keywords: avulsion fracture of fibular head, medial plateau fracture, concomitant injuries

Introduction

Tibial plateau fractures are frequently accompanied by proximal fibular fractures. The fibula has rich anatomical relations, some of which are important structures of the knee. These anatomical structures and the fibula itself are important for the stability and normal functioning of the knee. Therefore, the knee joint will receive the negative effects from the pathologies of the bone or soft tissue that may occur in fibula fractures ^[1]. Patients who sustain this type of fracture more frequently complain of lateral hamstring tightness and persistent lateral-sided knee pain. The treatment of tibial plateau fractures associated with proximal fibular fracture remains controversial. Options include open reduction and internal fixation (ORIF) with plates, screws, suture or combinations thereof depending on the fracture configuration and associated injuries ^[2].

The medial plateau fractures are often claimed to be associated with injuries to the posterolateral corner of the knee, such as fibular head avulsion fractures (arcuate sign), although the actual data on their incidence are quite limited^[3].

Case description

A 51-year-old male patient presented to the outpatient emergency department because of a left knee injury which he suffered as a cyclist hit by a car. The main complaints were pain in the left knee accompanied by swelling and limited range of motion. Neurovascular examination excluded urgent medical problems and distal sensory, motor, and circulatory disturbances. Diffuse swelling was observed on the knee joint, but there was no external wound. The range of motion and ligament integrity could not be checked due to severe pain and muscle guarding.

A plain X-ray of the left knee revealed avulsion fracture of the fibular head (Fig. 1A and 1B).

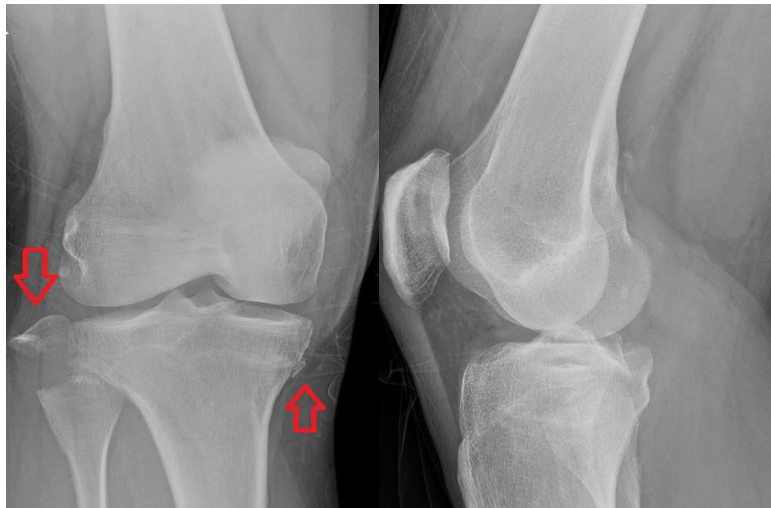


Figure 1. Plain X-ray of the right knee. (A) Anteroposterior view of the right knee with avulsion fracture of the fibular head and cortical defect on the medial tibial plateau. (B) Lateral view of the right knee.

The CT scan confirmed the fibula lesion and also revealed a fracture of the medial tibial plateau with no significant depression (Fig. 2 A and 2B).

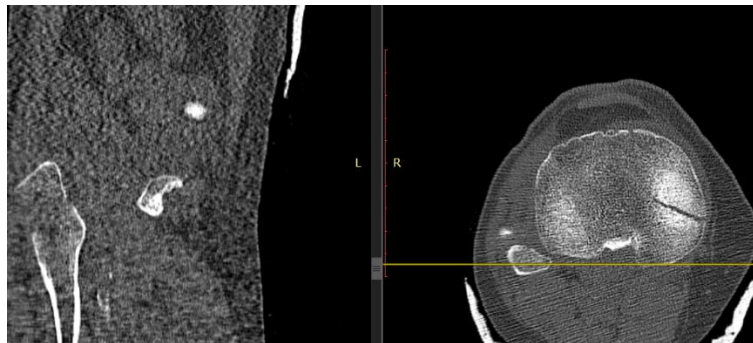


Figure 2. CT scan of the right knee. (A) Coronal view of the right knee with avulsion fracture of the fibular head.(B) Axial view of the right knee with fracture of the medial tibial plateau.

The fracture was classified as 4F1A/41B2.2 according to the Association for Osteosynthesis –Orthopaedic Trauma Association (AO/OTA)^[6].

The MRI showed impaction edema and bone marrow contusion of the posterolateral tibial plateau and of the medial femoral condyle with intact anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), MCL and LCL (Figure 3).

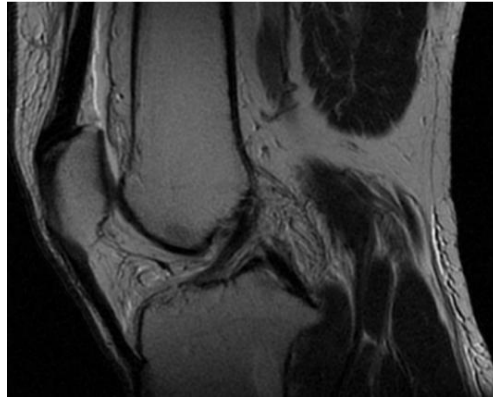


Figure 3. MRI of the right knee. Sagittal view of the right knee showing intact ACL

Surgery was performed two days after injury. The patient was in supine position. The surgery was performed under general anesthesia. Open reduction and internal fixation (ORIF) were done through posterolateral approach. The peroneal nerve was identified posterior to the biceps tendon. The iliotibial band was incised in line with its fibers beginning at the point where it crosses the lateral femoral epicondyle and proceeding distally. This exposed the insertion point of both the fibular collateral ligament as well as the popliteus tendon on the lateral femoral condyle. The peroneal nerve was explored and freed as it passed beneath the fascia in the anterolateral compartment of the lower leg. Inspection of the other posterolateral corner structures was done. Blunt dissection was carried out around the biceps tendon to mobilize it and to aid in the reduction of the fragment. Reduction was achieved with a small clamp placed on the fibula and the bone fragment. The reduction was confirmed with intraoperative X-rays and tension band fixation was used (Fig. 4). The medial tibial plateau was fixed with two 3.5 mm cortical screws, percutaneously under X-ray guidance (Fig. 4A and 4B). The postoperative period was uneventful and the patient was discharged on the second postoperative day.



Figure 4. Postoperative plain X-ray of the right knee. (A) Anteroposterior view. (B) Lateral view.

Early passive range of motion exercises started on the first postoperative day while the rehabilitation period lasted for four weeks. Weight-bearing was allowed during the third week after the surgery.

Discussion

Patients with this kind of injury usually suffer a high-energy trauma and we should be careful not to miss vital organ injuries. In our opinion, the key to success in managing such complex injuries is a cautious approach, evaluating the patient as a whole and not focusing solely on the obvious injury. The mechanism of injury in these patients suggests that there may be additional injuries. Hence, a CT trauma series was done. Only after ruling out vital injuries, we could then focus on the complex knee injury.

Sometimes the medial plateau fracture can be subtle, as in this case, therefore it is important to do a CT scan. The medial plateau fractures are often claimed to be associated with injuries of the posterolateral corner of the knee, such as fibular head avulsion fractures (arcuate sign), although the actual data on their incidence are quite limited^{[3], [4]}.

Magnetic resonance imaging is useful for the evaluation of associated soft-tissue injuries in patients with the arcuate sign on conventional radiographs. Avulsion injury of the proximal fibula is an important indicator of the internal derangement of the knee and for predicting the mechanism of an injury with varus stress^[5]. In our case, MRI showed intact anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), medial collateral ligament (MCL) and lateral collateral ligament (LCL).

The treatment of these complex cases varies, starting from conservative treatment (non-displaced fractures) to ORIF using screw fixation only, plates, tension band wiring, or a combination of all. The aim of the proximal fibular fracture operation serves for two general purposes. The first one is the exploration of the common peroneal nerve injury with the proximal fibular fracture. The second is the stability reconstruction of the joint. After the reduction of the fracture, external force that leads to shift the fracture end mainly comes from the femoral biceps tendon. According to AO/OTA, main indications for surgical treatment are: extraarticular fracture of the fibular head, displaced and/or unstable, varus instability of the knee. Regarding implant selection, tension band wiring is stronger than a single screw for the fibular head fracture^[6].

In our case, during the preoperative phase, the patient was in bed rest; he was given parenteral analgesics; the knee was elevated and cold dressings were applied. The patient was operated on the second day of injury. Antibiotic prophylaxis was used prior to incision according to protocol. The patient was mobilized the day after surgery and passive range of motion exercises were encouraged. The patient was discharged on the second day post-surgery. He was given crutches and a prospect for the rehabilitation protocol. On the third week following surgery, the patient started weight bearing and at six weeks he was using only one crutch. At eight weeks after surgery, the patient could move without crutches and had a full range of motion.

Conclusion

Fractures of the medial tibial plateau with concomitant avulsion fracture of the fibular head are complex injuries that require meticulous approach. The key to success is accurate diagnostics, recognizing the problem and treating each problem accordingly. The goal is anatomical reduction and absolute stability which will allow early motion and mobilization.

Conflict of interest. None declared.

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