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Anterior cruciate ligament reconstruction with retained internal fixation hardware for treating Schatzker type V tibial plateau fracture: Two case reports

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ABSTRACT

Despite the high incidence of anterior cruciate ligament injury in patients with tibial plateau fractures, we found no reports about anterior cruciate ligament reconstruction with retained internal fixation hardware for these fractures. Herein, we report 2 male patients with Schatzker type V tibial plateau fractures and describe the use of retained hardware for internal fixation in tibia. The patients underwent anterior cruciate ligament reconstruction using outside-in technique for the femoral tunnel. Throughout the follow-up, no radiological symptoms of suspected knee osteoarthritis were observed. Accordingly, surgical intervention can be reduced by creating an independent femoral tunnel.

Introduction

Tibial plateau fractures account for approximately 1 % of all fractures [1]. The overall incidence of anterior cruciate ligament (ACL) injury in patients with tibial plateau fractures is 80 % [2]. Although a tibial plateau fracture associated with knee ligament injury does not adversely affect postoperative patient-reported outcomes [3], no studies have reported ACL reconstruction with retained internal fixation hardware for tibial plateau fractures. Hardware removal would impose a physical and financial burden on the patient [4]. Therefore, we present two cases of ACL reconstruction with retained internal fixation hardware for Schatzker type V tibial plateau fractures.

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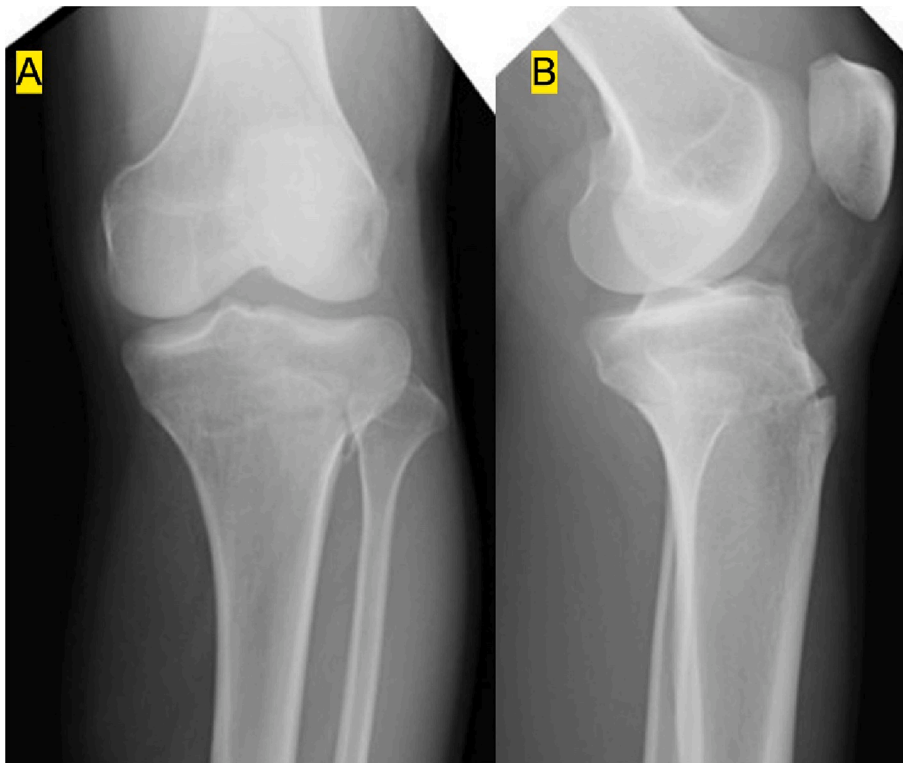


Fig. 1. Preoperative images of the right knee: (A) anteroposterior and (B) lateral view before surgery.

Case 1

Case history

A 33-year-old male complained of chronic knee instability while walking and climbing stairs. Six months before his visit, he was rear-ended by a car while riding a motorcycle and was sent to the emergency department of a tertiary university hospital. Radiographs showed a left basicervical femoral neck fracture [Arbeitsgemeinschaft für Osteosynthesefragen (AO) 31B3], left femoral shaft (AO 32A3), left distal femur (AO 33A2), and left tibial plateau (AO 41C1.2 and Schatzker V) [5]. MRI of the left knee showed ACL rupture at the proximal side. Emergency intramedullary nailing was performed using Natural Nail System (Zimmer Biomet, Warsaw, IN, USA) for the left basicervical femoral neck fracture, left femoral shaft fracture, and left distal femur fracture (Fig. 1). The left tibial plateau fracture was treated with 3.5 mm Locking Compression Plate (LCP) Proximal Tibia Plate—Low Bend (DePuy Synthes, Oberdorf, Switzerland) and 3.5 mm LCP Medial Proximal Tibia Plate (DePuy Synthes) through posterior medial and anterolateral skin incisions one week after admission. The medial and lateral displaced fracture fragments were directly and simultaneously decompressed and retained with a periarticular decompression clamp. Anterior medial and lateral fixation were then performed with 3.5 mm LCP. The distal attachments of hamstring tendons were identified 45 mm below the medial joint line [6] for graft harvesting during future ACL reconstruction. Care was taken to detect all branches of hamstring tendons and these branches were cut to release them. Then, hamstring tendons were scooped with a Kelly clamp and wet gauze. The distal attachments of these two tendons are left connected to the proximal tibia and a medial LCP was inserted under the two tendons. Fracture union was radiologically confirmed 4 months after the surgery.

Surgical procedure of ACL reconstruction

ACL reconstruction was performed under general anesthesia 6 months after initial surgery for left tibial plateau fracture. Routine proximal medial tibial skin incision was placed for hamstring graft harvest. Light adhesions were observed between LCP and hamstring tendons. Hamstring tendons remained intact and tendon harvest was successfully performed. The harvested ipsilateral hamstring tendons were quadrupled and connected with suspensory fixation device and artificial ligament [7]. Independent anatomical femoral using outside-in technique and tibial tunnels under fluoroscopy were created. The graft fixation was performed using two staples with traction force of 30 N under 20° of knee flexion [8] under fluoroscopy in order that staples did not interfere with distal locking screws inserted into LCP. (Fig. 2). During a 2-year follow-up, no superficial or deep infection was observed, and the Lysholm score (best: 100, worst: 0) improved from 47 to 81 at the last follow-up. No radiological signs of suspected knee osteoarthritis (KOA) were observed.

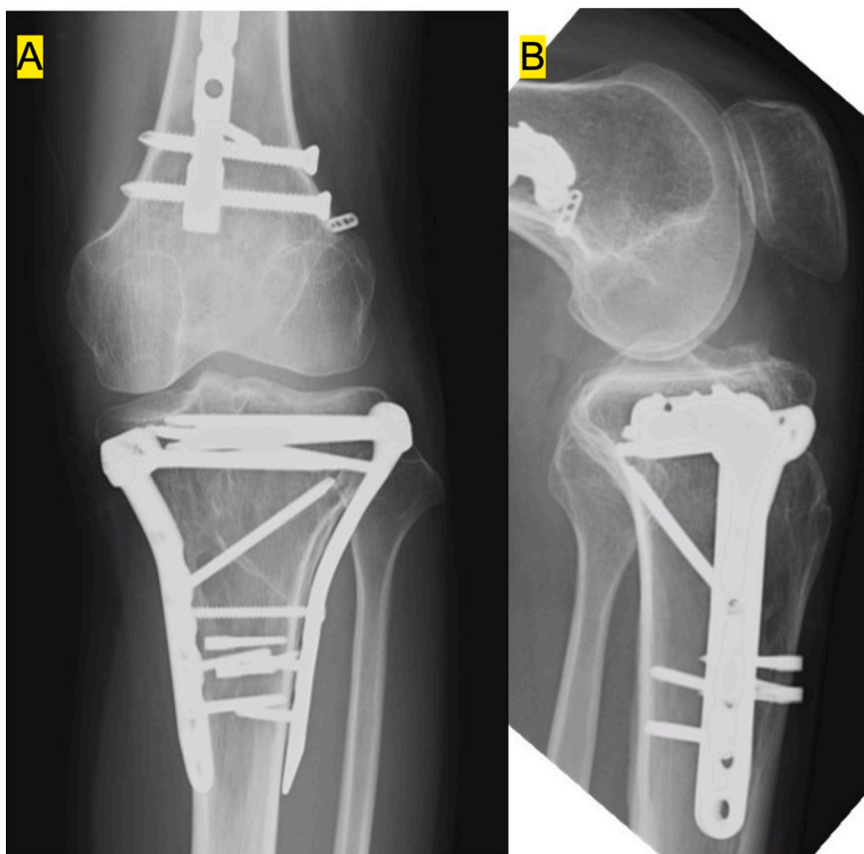


Fig. 2. Postoperative images of the right knee: (A) anteroposterior and (B) lateral view six months after surgery.

Besides, the patient can now walk and run without any giving way of the affected knee. He is able to return to work efficiently and play golf as he did before the surgery.

Case 2

Case history

A 42-year-old male complained of chronic knee instability while walking. Six months before his visit, he had an automobile accident and was sent to the emergency department of a tertiary hospital. Radiographs showed a left tibial plateau (AO 41C1.2 and Schatzker V) [5] (Fig. 3). Emergency joint spanning was performed using external fixation (EF) two days after admission. MRI of the left knee also showed ACL rupture at the proximal side. The left tibial plateau fracture was treated with 4.5/5.0 mm LCP Proximal Tibia Plate (DePuy Synthes) and 3.5 mm LCP Medial Proximal Tibia Plate (DePuy Synthes), through posterior medial and anterolateral skin incisions, one week after EF. The medial and lateral displaced fracture fragments were treated as in Case 1. Anterior medial and lateral fixation were then performed with 3.5 and 4.5/5.0 mm LCP. The gracilis tendon and semitendinosus tendon were identified for graft harvesting as in Case 1. Fracture union was radiologically confirmed 4 months after the surgery.

Surgical procedure of ACL reconstruction

ACL reconstruction was performed similarly to Case 1 (Fig. 4). During a 2-year follow-up, no superficial or deep infection was observed, and the Lysholm score improved from 59 to 85 at the last follow-up. No radiological signs of KOA were observed. Besides, the patient can now play golf as well as before the injury.

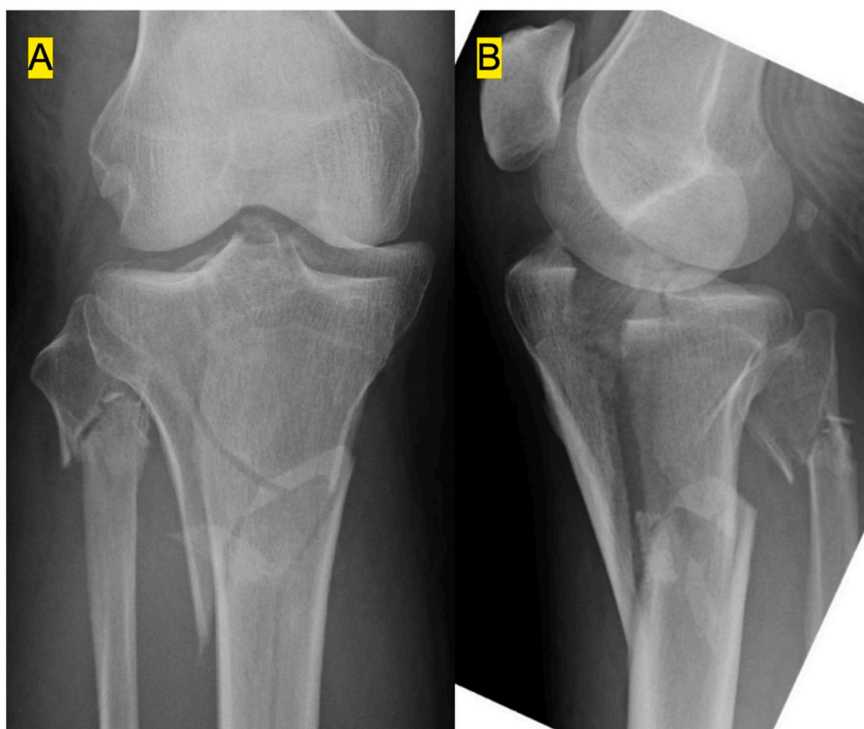


Fig. 3. Preoperative images of the right knee: (A) anteroposterior and (B) lateral view before surgery.

Discussion

Transtibial (TT) single bundle (SB) ACL reconstruction is widely used but risks a nonanatomic placement due to constrained drilling [9]. To create a femoral tunnel behind the resident ridge using the TT SB ACL reconstruction, the coronal and sagittal angles of the tunnel should be set at averaged 25.5° in the coronal view and 52.3° in the sagittal view referencing the anterior tibial crest and fibula [10]. In our cases, multiple locking screws were inserted, which may limit the orientation of the tibial tunnel and increase the risk of nonanatomic placement of the femoral tunnel. Therefore, the femoral and tibial tunnels should be created independently using the transportal or outside-in technique [8] not dependently using transtibial technique which constrains the orientation of the tibial tunnel. Tibial side graft fixation requires great care because staples or screws sometimes interfere with distal locking screws inserted into LCP. Therefore, fluoroscopy assisted tibial side graft fixation is safe and effective procedure.

Conclusion

Bilateral plating and staged ACL reconstruction for tibial plateau fractures (Schatzker type V) and ACL injuries have shown good clinical results, although screws may limit tibial tunnel creation. For treating such cases, a femoral tunnel can be created independently using the transportal or outside-in technique not dependently using transtibial technique which constrains the orientation of the tibial tunnel. ACL reconstruction with retained hardware for internal fixation of tibial plateau fractures is considered suitable treatment options for reducing surgical invasion.

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Declaration of competing interest

None.



Fig. 4. Postoperative images of the right knee: (A) anteroposterior and (B) lateral view six months after surgery.

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