

Case Report

A large laterally displaced osteochondral fragment from dislocated patella: Case report and possible mechanism

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ABSTRACT

Dislocation of the patella is not a common disorder of the knee joint and is seen most frequently in the adolescent population. Osteochondral fractures account for approximately 5–74% of all acute patellar dislocations and are easy to overlook. The mechanism of injury and presentations of fractured fragments were seldom well describe in published studies. The case reported here is that of a 17-year-old baseball player who suffered an acute patellar dislocation with a large osteochondral fragment fracture, where the fragment presented over the lateral supracondylar aspect of the distal femur. Open reduction and fixation with Kirschner wires gave a good result. Osteochondral fracture of patella is usually regarded as a dislocation phenomenon. However, we review and discuss here three injury mechanisms, and suggest the possible mechanisms by which patellar relocation could have caused our patient's injury and the rare occurrence of a laterally displaced osteochondral fragment over the distal femur.

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1. Introduction

Dislocation of the patella is not a common disorder of the knee joint and is seen most frequently in the adolescent population,^{1,2} while osteochondral fractures account for approximately 5–74% of all acute patellar dislocations.^{2–4} However, only 5–36% of patellar dislocations are detected on plain radiographs^{4–6} and the disorder is easily overlooked or misdiagnosed. Even with use of arthroscopy⁶ and magnetic resonance imaging (MRI),^{5,7,8} diagnosis is accurate in only 70–85% of cases.

Osteochondral fracture of the patella is thought to occur as a result of patellar dislocation; nevertheless Nietosvaara et al⁹ reported that 15 of 72 patients presenting with intra-articular fragments after acute patellar dislocations had a history of spontaneous relocation of the patella. These authors suggest that osteochondral injury occurs during patellar relocation. On the basis of clinical examinations, lateral condyle dysplasia (abnormally high sulcus angle), patella alta, contracture of lateral retinaculum and iliotibial band (positive Ober test), genu valgus (increased Q angle), and pronated foot have been considered to be associated with a high incidence of patellar instability contributing to osteochondral

fracture.^{3,10,11} Rorabeck and Bobechko² have described different types of osteochondral fracture pattern following acute patella dislocation and observed the frequent occurrence of inferomedial patellar fracture. An osteochondral fragment is detectable by radiographs on a lateral or tangential view,^{7,8,12,13} and most defects have been found in the inferomedial aspect of the patella.^{7,8,14} Nomura et al¹⁴ used arthroscopy to observe articular cartilage injuries in knee joints; they described the sites involved and cartilage defects, and cracks in the patella in acute patellar dislocation. However, in none of these studies were the actual positions of fracture fragments well described.

In this paper we present the case of a 17-year-old baseball player who presented with acute patellar dislocation, and in whom a large osteochondral fragment was situated over the lateral supracondylar aspect of distal femur. This patient had no history of patellar dislocation or factors predisposing to patellar instability. We propose that this large osteochondral fracture of the patella occurring in a case of patellar dislocation was possibly associated with patellar relocation.

2. Case report

Our patient was a 17-year-old, healthy male baseball player (height 77 cm; weight 65 kg) who was well before sustaining a knee injury. He felt a “snap” within his right knee during the accelerated phase of his bat swing. He fell down backwards, and

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was unable to stand up. He was transferred to a local hospital, and presumed to have a knee sprain. The patient presented in our orthopedic clinic 4 days after injury, walking with a limp. He had severe swelling around his right knee, which had a limited range of movement. Radiographic examination showed a thin vertical fragment over the lateral aspect of the distal femur (Fig. 1); the patella was well relocated in the sulcus groove. The initial diagnosis was osteochondral fracture with hemoarthrosis of right knee. An immediate operation was suggested, without prior arthroscopic assessment or MRI, as the osteochondral fracture was clearly seen on a plain radiograph.

Open reduction and internal fixation was indicated, and it was anticipated that it would be easy to explore the associated ligament injuries, or the lateral femoral condyle fracture. Before operation, physical clinical assessment showed the range of motion of the knee to be only 20–50 degrees. The left and right leg differed in circumference by 8.5 cm at the knee joint. The gross Q angle was approximately 11 degrees. The Insall index was 1.25 (normal range 0.70–1.3) and the Norman index was 0.2 (normal range 0.17–0.25).

A lateral longitudinal approach was taken to the patella, with a 10-cm incision. During the surgical procedure, about 200 cc of bloody fluid, containing fat droplets, was drained and three small osteochondral fragments, approximately $0.3 \times 0.3 \times 0.2$ cm, were observed over the lateral border of the lateral femoral condyle. The articular surface of the distal lateral femoral condyle had sustained a defect as a result of the small osteochondral fragments, which were removed during surgery. A rarely seen large osteochondral fragment ($4.0 \times 3.0 \times 1.5$ cm) involving the patella crest¹² was found over the lateral aspect of the supracondylar pouch of the distal femur (Fig. 1). In addition, a large osteochondral defect (Fig. 2) was found over the medial aspect of the patella, and a torn medial retinaculum. An incision was therefore made over the medial border of the patella. Use of a threaded screw is the optimal fixation method for a patella fragment,¹⁵ but a mini-screw or Herbert screw was too short (10–30 mm) to fix this large fragment, while small or large screws could have disrupted the fragment. Therefore three mini 1.8 mm smooth Kirschner wires were carefully applied (Fig. 3). The torn retinaculum was repaired and a long leg splint applied.

A program of physical therapy was devised for the patient, including: passive joint movement; muscle strength training; infrared rays; ultrasound; balance training; and walking training to improve muscular strength, soft tissue flexibility, and joint mobility. He regained a full range of motion in the knee after the

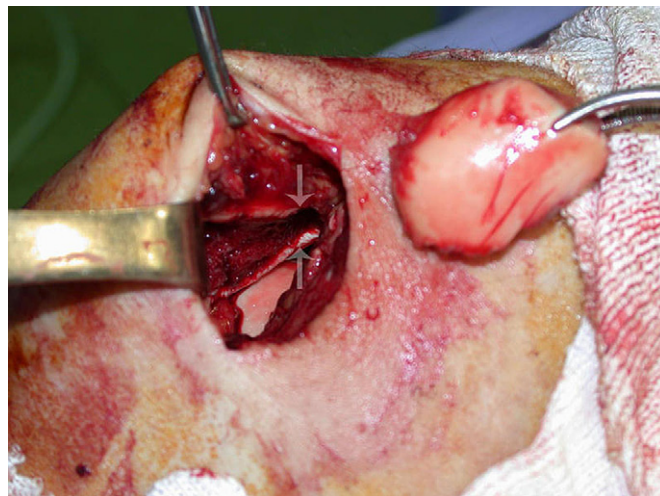


Fig. 2. A medial patella border approach: The large osteochondral defect was found over the medial aspect of the patella (between the arrows), with a torn medial retinaculum. A large osteochondral fragment ($4.0 \times 2.7 \times 1.5$ cm) was prepared, to fix into the medial patellar bony defect.

3-month rehabilitation program and was allowed to return to full activity.

The three Kirschner wires were removed 6 months later. Examination by arthroscopy showed no ligament or meniscus injury, and a radiograph showed no clinical parameters predisposing to patellar subluxation (Fig. 4). The Insall index was 1.25 (normal range 0.70–1.3) and the Norman index was 0.2 (normal range 0.17–0.25). The sulcus angle was 138 degrees (normal range 131–45 degrees) and the Q angle was 12 degrees (male normal range <15 degrees). Physical examination revealed no iliotibial band tightness (negative Ober test) and pes planovalgus.

The patient returned to normal daily activity and excellent sports function 9 months after the operation.

3. Discussion

Dislocation of the patella is usually the result of indirect trauma.¹⁶ Rorabeck and Bobechko² proposed that, in 18 patients,

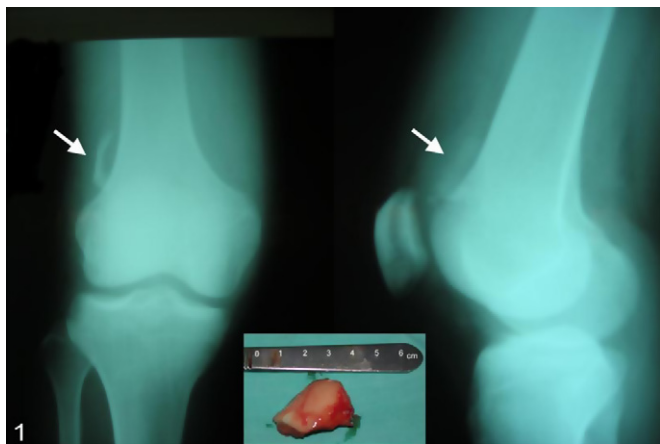


Fig. 1. Preoperative anteroposterior and lateral views of the knee, showing a large osteochondral fragment ($4.0 \times 2.7 \times 1.5$ cm) at the lateral supracondylar pouch of the distal femur.

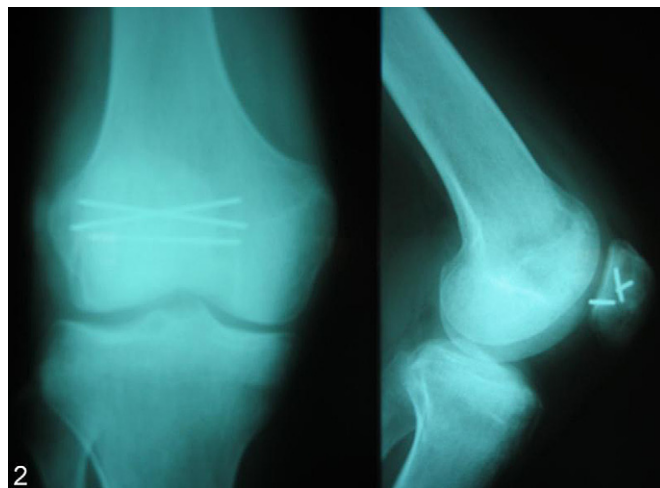


Fig. 3. Postoperative anteroposterior and lateral views. The osteochondral fragment was reduced by internal fixation with three mini 1.8 mm smooth Kirschner wires.

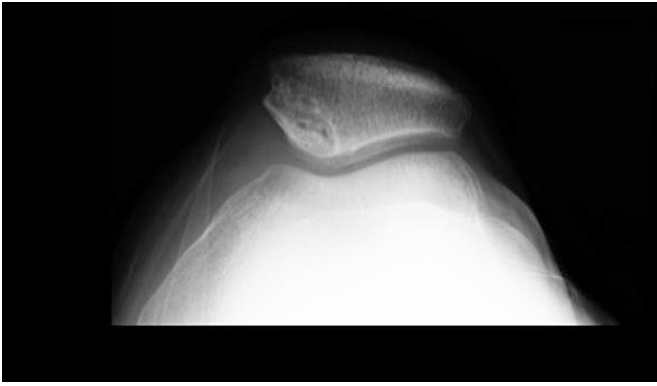


Fig. 4. Merchant view of the patella at 1 year after surgery, showing no subluxation of the patella.

acute patellar dislocation was associated with osteochondral fracture. However, in only a small proportion could the location of the osteochondral fragment be detected by radiographs in lateral or tangential views,^{7,8,12,13} possibly because the tiny fragments over the medial patella were in the shadow of the femoral bone. Predisposing factors to patella instability are considered to include lateral condyle dysplasia, excessive Q angle, tight iliotibial band,

and a history of patellar subluxation and dislocation. Once an unstable patella has dislocated, relocation readily occurs,⁸ and any resulting fractured osteochondral fragments could be relatively small. Dislocation of the patella may result in a torn medial retinaculum or a cracked patellar surface, and ligament avulsion may cause a fragment to break off from the medial aspect of the patella. Arthroscopy⁶ and MRI^{5,7,8} allow an accurate diagnosis in approximately 70–85% of cases, and patellar dislocation has not been associated with ligament or meniscus injury.^{2,8,17} In 50% of cases osteochondral fracture of the patella requires resection, because of the small and medially displaced extra-articular fragments.² However, Toritsuka et al¹⁷ recently suggested that detached ligamentous tissue could be sutured with Mitek GII anchors. The injury was an avulsion fracture between ligament and bone (Fig. 5A).

Visuri and Kuusela¹⁸ stated that a lateral patellar subluxation could combine with a large, medially located osteochondral fragment involving the whole medial facet of the patella. This type of osteochondral fracture was diagnosed in the axial projection of the patella, and the patella was dislocated proximally. The mechanism of injury could be that internal rotation of the femur, while the foot was firmly fixed to the ground, caused the chondral surface of the patella to be compressed against the chondral surface wedge of the lateral femoral condyle. This compressive impact during patellar dislocation resulted in a larger fracture, with the patella remaining subluxated over the lateral femoral condyle and the fragment

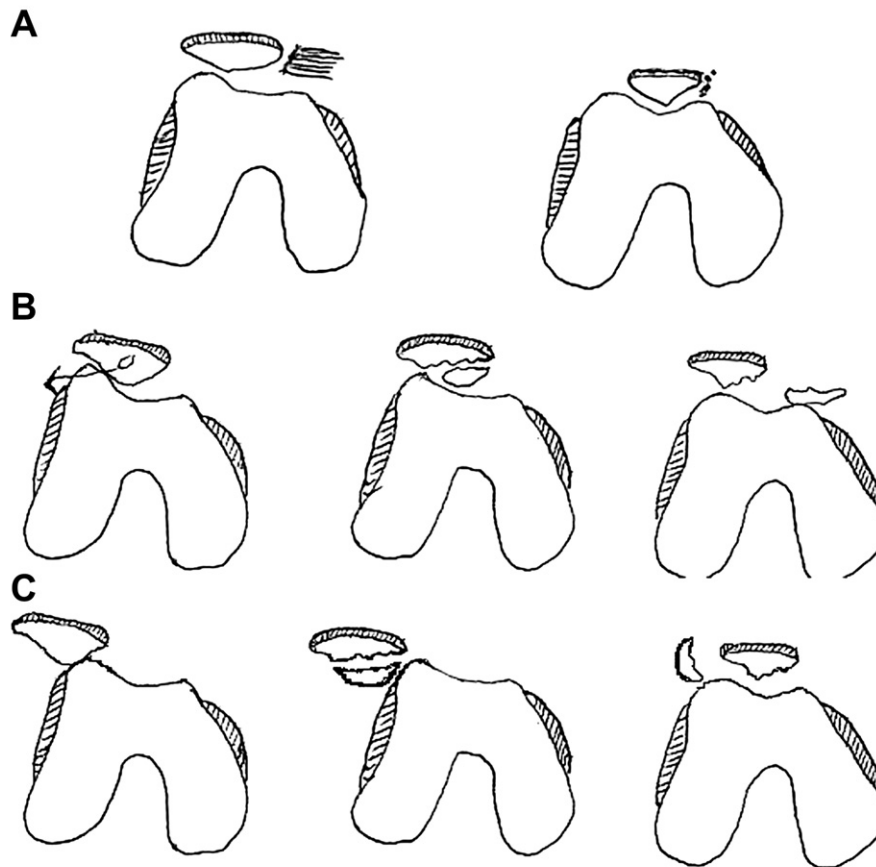


Fig. 5. Patellar dislocation caused (A) an avulsion fracture between ligament (medial retinaculum) and bone and (B) an osteochondral fracture between the articular cartilages; (C) following patellar relocation, the osteochondral fragment resulting from the fracture is located between the lateral facet of the patella and the lateral femoral condyle.

remaining in the medial position. The injury was an osteochondral fracture between the articular cartilages (Fig. 5B).

In the study by Nietosvaara et al,⁹ 60% (43/72) of acute patellar dislocation patients had a history of spontaneous relocation of the patella, and spontaneous relocation occurred in all 15 patients in whom there was an intra-articular osteochondral loose body. According to their patients' reports, the spontaneous relocation meant that the dislocation had gone unrecognized. If during patellar relocation the patella moves against the steeper edge of the lateral aspect of the femoral condyle, rather than the smooth chondral surface of the medial aspect of the femoral condyle, the result could be a greater compressive impact between osteochondral structures of the patella edge and the femoral condyle, and hence a larger osteochondral fracture.

Our patient stated that a "snap" occurred within his right knee during the acceleration phase of his bat swing, and that then he fell down backwards and was unable to stand up. A possible mechanism for his injury is that the patella dislocated during the back-swing phase, while the knee was flexed and the femoral bone externally rotated on a fixed tibia and foot; then during the forward bat swing, with the femoral bone internally rotated and strong quadriceps contraction, the dislocated patella was driven back. With the lateral femoral condyle acting as a wedge and the patella as chisel, the patellar relocation produced a large osteochondral fracture;¹⁹ the resulting fragment was located between the lateral side of the patella and the lateral femoral condyle (Fig. 5C).

Osteochondral fracture injury has usually been regarded as a dislocation phenomenon, but the case osteochondral fracture reported here led us to consider the possible mechanism of the injury. We have reviewed and discussed three injury mechanisms, and believe that in our patient the large and laterally displaced osteochondral fragment could have been the result of patellar relocation following acute dislocation.

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