CLINICAL REPORT

Lateral femoral condyle osteochondral fracture combined to patellar dislocation: A case report

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Summary
The authors report the case of an osteochondral fracture involving the weight-bearing portion of the lateral femoral condyle in a 23-year-old sportsman. The defect was concomitant to a lateral patellar dislocation involving a rare injury mechanism. Fixation of the osteochondral fragment was performed with bioabsorbable pins and healing was achieved within an acceptable time. Clinical and radiographic outcome at one year is highly satisfactory and bioabsorbable implant fixation reveals to be a worthwhile option in such a case. This rare lesion is diagnostically challenging and requires an adapted and prompt treatment.

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Introduction
Lateral patellar dislocation is quite a common injury that typically occurs in the young athletic individual and occasionally associated with chondral defects. These injuries frequently involve the non-weight-bearing portion of the lateral trochlear margin and the medial patellar margin thus corresponding to impaction injuries. Osteochondral fracture involving the weight-bearing portion of the lateral femoral condyle is relatively rare injury as it involves hyper flexion of the knee at the time of dislocation. The available treatment options of these rare fractures include osteosynthesis screws or excision with surgical debridement. We report on a case of lateral patellar dislocation associated with an osteochondral fracture involving the weight-bearing surface of the lateral condyle managed with polydioxanone bioabsorbable pin fixation and resulting in successful clinical and radiographic results.

Observation
A 23-year-old man, with no previous clinical history, and practicing martial arts activities on a regular basis, initially presented with left knee pain and limited mobility but reported no specific traumatism during the practice of his combative sport. He reported a sensation of the left knee "giving way" and an audible pop during an extension movement while his left lower limb was in 60° of knee-weight-bearing flexion at the moment of injury. His left knee was locked with the quadriceps fully contracted with no external direct force applied. He fell to the ground as

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a result of knee collapse. The patient presented to the emergency department with a swollen painful knee. The clinical examination revealed a knee flexion deformity of about 10°, a joint effusion of the knee, pain throughout the range of motion and upon palpation of the medial border of the patella, no observable ligamentous laxity and an efficient extensor mechanism of the knee. Initial radiographs demonstrated a loose intra-articular osteochondral fragment from the lateral femoral condyle (Fig. 1). A thorough examination of the knee joint with 3D CT scan thus confirmed the presence of a voluminous osteochondral fragment from the weight-bearing portion of the anteroinferior aspect of the lateral condyle associated with a shearing fracture of medial patellar margin consistent with prior lateral patellar dislocation (Fig. 2) Clinical examination was completed and the ordered absorbable device was received ten days after trauma. On the tenth post-trauma day, reduction and loose fragment fixation were performed through a lateral parapatellar approach. Intraoperative findings revealed a 3 cm long and 1 cm wide osteochondral fragment from the weight-bearing portion of the lateral condyle (Fig. 3). A chondral defect associated with small bone fragments was also observed at the medial margin of the patella. A curettage was performed at the site of the condylar defect and fixation of the osteochondral fragment was carried out using five polydioxanone bioresorbable pins (Ethipin, Ethicon, Johnson and Johnson Intl, Braintree, Massachusetts). The bioresorbable implants of 1.3 mm diameter and 40 mm long were inserted perpendicular to the cartilaginous surface after drilling with a specific calibrated drill bit. The pins were introduced up to 30 mm long, the protruding section being cut level with the articular surface. Right after surgery, anatomical reduction and stable fixation were assessed by successive knee flexions. After wound closure, a knee extension brace was then applied for a period of 6 weeks after which active and passive motion up to 60° of knee flexion was introduced into the patient’s rehabilitation schedule. Weight-bearing was prohibited during the first 3 months. Full mobilization and weight-bearing were initiated 3 months after surgery. The patient was reviewed at regular intervals with systematic clinical and radiographic assessments. Two MRI scans were acquired at 4 months and one year respectively, both demonstrating satisfactory anatomic reduction, complete healing of the fragment, no evidence of necrosis and adequate pin resorption (Fig. 4). The patient was able to return to normal sporting activities 6 months after surgery. At one year-follow-up, he experienced full pain relief, his gait was fluid and he was able to perform up to 130° of knee flexion with full restoration of extension. Neither articular instability nor incongruency was observed.

Discussion

Osteochondral defect of the lateral femoral condyle is common sequela after lateral patellar dislocation, mostly involving the non-weight-bearing portion of the anterolateral aspect of the condyle. This injury pattern can be
explained by the mechanism of injury. Actually, lateral patellar dislocation occurs during an extension movement while the knee is in slight flexion ($20^\circ$ to $30^\circ$); Vastus lateralis contraction produces a significant lateral force on the patella which is applied on the trochlear articular surface. During that stage of dislocation, the patella lies along the trochlear antero-lateral margin thus giving rise to the classical pattern of injury involving the infero-medial pole of the patella and the non-weight bearing portion of the anterolateral femoral condyle. The above injury pattern is typically defined as an impaction injury.

Osteochondral injuries involving the weight-bearing portion of the lateral femoral condyle suggest that the patient’s knee is in high degree of flexion at the time of dislocation. This paradoxical and uncommon injury pattern - the patella being securely stabilized within the trochlear groove when knee is in high degree of flexion – is rarely documented in the orthopedic literature. The short series of weight-bearing portion osteochondral fractures reported by Mashoof et al. is the only one in the literature which is entirely dedicated to that specific injury pattern. He describes similar defects to the one reported in our case, associated with patellar dislocations, no evidence of direct trauma, managed with screw fixation or excision of the weight-bearing portion fragments. According to the author, the frequency of this injury pattern remains low as only seven cases were reported within 6 years [1]. Contradictorily, the MRI findings of a multi-center retrospective study reviewing 25 cases of patellar dislocation, show a 20% incidence of weight-bearing portion osteochondral fractures which further supports the theory of a different mechanism of injury. In the light of such findings, the author therefore acknowledges a greater incidence of this kind of injury than previously expected. This article also confirms that such mechanism of injury involving the weight-bearing portion of the condyle, requires a high degree of knee flexion [2]. Therefore, injuries involving the weight-bearing portion are not only characteristic of a knee flexion impaction injury but also correspond to an osteochondral defect associated with patellar dislocation resulting from a twisting injury of the knee in weight-bearing condition during an extension movement. The reported incidence of chondral defects associated with patellar dislocation varies from 5 to 80%, as these results both include typical contusion patterns and uncommon osteochondral loose fragments [3]. In 1976, Rorabeck et al. describes four cases of lateral condyle osteochondral fractures following 18 cases of patellar dislocation in children [4]. Dainer et al. reports on 58% of chondral defects of the patella and 45% of chondral injuries of the femoral condyle after patellar dislocation [5]. Nomura et al. carries out a review of the arthroscopic and arthrotomy findings of the knee in a series of 39 lateral patellar dislocations and reports a 8% incidence of osteochondral fracture involving the weight-bearing portion of the lateral condyle [6].

This diagnosis is rarely established during the first examination. However, any evidence of acute knee pain with or without trauma followed by knee effusion and major loss of mobility should help suspect patellar dislocation associated with osteochondral defect. If tense hemarthrosis is diagnosed after articular puncture of the knee joint, early iconographical examination should be performed to identify osteochondral defects and apply appropriate treatment.

A thorough analysis of correlating elements between radiographic and arthroscopic findings points out the limited efficacy of standard radiographs in detecting osteochondral defects after patellar dislocations. Only 11 out of 48 radiographs could diagnose an osteochondral defect whereas 34 were identified by arthroscopy, 16 of which revealing loose fragments from the lateral condyle (33%) [7]. As a result, MRI can play a key role in establishing the correct diagnosis when performed early [2,7]. CT scan of the knee is a more accessible method for diagnosis and might provide accurate defining of the presence, location and size of the osteochondral fragment.

Surgical management strategies for osteochondral fractures involving the weight-bearing portion usually include excision and curettage or internal fixation using screw or any available osteosynthesis device. Toupin et al. has emphasized the need for early treatment. After a period of ten days post-trauma, the osteochondral fragment volume gradually increases and fibrous tissue develops at the fracture site which may prevent proper reduction [8]. There are few reports in the literature about the use of bioresorbable fixation devices in this kind of injury pattern although they offer the undeniable advantage to obviate the need for a removal procedure and demonstrate low arthrogenous properties since they progressively disappear from the joint throughout the degradation process. Plaga [9] investigated the use of Kirshner wires, cyanoacrylate adhesives and bioresorbable pins in the fixation of condylar fractures in rabbits and demonstrated the efficacy of bioresorbable implants in unstable fractures reporting a 86% rate of bony unions compared with 100% with Kirshner wires. Fuchs [10] also reports favourable results with bioresorbable implants in the treatment of knee and ankle osteochondral fractures in a series of 15 patients with anatomic fragment union identified at the time of MRI examination. Finally, Braune et al. [11] report a case of osteochondral fracture of the lateral femoral condyle in an adolescent, managed with polydioxanone pin fixation. The arthroscopic examination
revealed healing of the osteochondral fragment at 7 month-follow-up. In our study, bioresorbable pins perpendicularly inserted in the articular surface provided sufficient stability to achieve satisfactory healing time.

**Conclusion**

Osteochondral fracture to the weight-bearing surface of the lateral femoral condyle associated with patellar dislocation is an uncommon lesion. The mechanism of injury includes patellar dislocation in a highly flexed knee or a weight-bearing twisting knee mechanism associated with dislocation. Such mechanism of injury accounts for the low incidence of these lesions and their challenging diagnosis. MRI is therefore a valuable method. The best available surgical treatment is internal fixation. The use of bioabsorbable polydioxanone pins obviates the need for a removal procedure, significantly reduces the risk of iatrogenic cartilage defect and provides enough stability to achieve proper healing of the osteochondral fractures involving the weight-bearing portion of the lateral condyle. Our excellent clinical and radiological results show that the use of bioabsorbable devices is a worthwhile option in the treatment of this type of osteochondral defect.

**References**


