



## Case Report

# Femoral condyle osteochondral fracture treated with bone suture after acute patellar dislocation: a case report<sup>☆</sup>



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### ABSTRACT

Osteochondral fracture after acute patellar dislocation in teenagers is relatively common (up to 60% of cases of patellar dislocation), but poorly diagnosed. There are several treatments proposed for this type of injury, but none well defined in the literature.

A male patient, 13 years old, with a diagnosis of osteochondral fracture of the lateral femoral condyle after acute dislocation of the right patella. He underwent surgical treatment of the chondral injury, which consisted of suturing of the chondral fragment to the cartilage defect and, in a second approach, reconstruction of the medial patellotibial ligament and medial patellofemoral ligament with autologous flexor graft. Currently, the patient has been followed up for 16 months postoperatively for the suture of the chondral fragment and for 8 months for the ligament reconstruction. He has been evaluated through functional scores and T2 weighted magnetic resonance imaging. Acute fixation through direct bone suturing of a purely chondral fragment can be considered in special situations.

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### Lesão condral do fêmur tratada com sutura óssea após luxação aguda de patela: um relato de caso

### RESUMO

A fratura osteocondral após luxação aguda de patela em adolescentes é relativamente comum (até 60% dos casos de luxação patelar), porém pouco diagnosticada. Existem diversos tratamentos propostos para esse tipo de lesão, mas nenhum está bem definido na literatura. Paciente do sexo masculino, 13 anos, com diagnóstico de fratura osteocondral do côndilo femoral lateral, após luxação aguda da patela direita. Foi submetido a tratamento

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cirúrgico da lesão condral, que consistiu em sutura do fragmento condral ao defeito da cartilagem e, em um segundo tempo, a reconstrução do ligamento patelotibial medial (LPTM) e reconstrução do ligamento patelofemoral medial (LPFM) com enxerto autólogo de flexores. Atualmente o paciente encontra-se com o seguimento de 16 meses de pós-operatório da sutura do fragmento condral e oito meses da reconstrução ligamentar, foi avaliado através de escores funcionais e ressonância magnética com mapeamento de T2. Em casos especiais, pode-se considerar o uso de fixação aguda por sutura óssea direta de um fragmento puramente condral.

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## Introduction

A lateral patellofemoral dislocation is a relatively common injury in children and young adults; it is frequently associated with chondral or osteochondral injuries of the femur and/or patella.<sup>1,2</sup> These injuries may occur in up to 60% of cases<sup>3</sup> and are usually located in non-weight-bearing areas, such as the lateral region of the trochlea or the lateral femoral condyle, or the medial facet of the patella; the mechanism of trauma is impaction.<sup>4,5</sup> Less commonly, they may occur in the weight-bearing area of the lateral femoral condyle, when a dislocation occurs with the knee in flexion.<sup>1,6</sup>

Several treatments have been proposed for injuries with osteochondral fragments, such as fixation with metallic or absorbable materials, autologous osteochondral transplantation, and simple debridement.<sup>1,7,8</sup> However, in some rare cases, the injuries are solely cartilaginous or have minimal underlying subchondral bone, preventing the use of bone fixation. In addition to the technical difficulty of the fixation, the healing potential is lower in cartilage than in bone. Few successful cases of fragment reintegration have been reported for this type of injury.<sup>2,6,9</sup>

The authors present a case of acute patellar dislocation associated with a predominantly chondral fracture in the lateral femoral condyle weight-bearing area, secured with a transosseous suture and presenting good functional results. To the best of the authors' knowledge, this is the first report of reinsertion of an extensive chondral fragment with this fixation technique.

## Case report

A 13-year-old male patient, with no previous clinical history and no comorbidities, suffered a sprain to his left knee after a fall during a football match. He reported knee dislocation and severe pain. He was taken to the emergency room, where the initial assessment indicated the presence of important pain and edema of the left knee, and a fixed position of knee flexion. The anteroposterior and lateral view radiographs demonstrated an articular bone fragment, and that suggested the diagnosis of acute patellofemoral dislocation. He was then referred to the knee service of the Hospital das Clínicas.

During the physical examination at the referral service (three days after the trauma), it was observed that there

persisted pain on knee palpation, especially in the lateral region; effusion and movement restriction were also observed (range of motion: 20–110°), and the patient was unable to reach full extension. The patellar apprehension test was positive. No other ligament instabilities were observed; the muscle tone was normal and the extensor mechanism was intact. The radiographs showed an immature skeleton with unclosed physis and a bone fragment in the joint. A computed tomography of the knee was made for complementary evaluation, and associated injuries were excluded. The presence of an osteochondral fragment from the weight-bearing area of the lateral femoral condyle (Fig. 1A) was confirmed, as well as an increased patellar tilt (29°) and Dejour's grade B trochlear dysplasia (Fig. 1B).

The limb was immobilized with an inguino-malleolar splint with maximal extension to await surgical intervention, which was indicated due to the presence of a free osteochondral fragment and articular blockage.

The patient was operated 15 days after the trauma, on April 14, 2015; the surgical plan was to first assess and treat the cartilage injury. The lateral parapatellar access was used, which allowed the removal of the detached fragments and a good visualization of the fracture site. The injury involved almost the entire weight-bearing area of the lateral femoral condyle (Fig. 2A) and was 3.0 cm long by 1.5 cm wide, at a depth of 0.3 cm (cartilage depth). The removed loose bodies (Fig. 2B) had a small piece of subchondral bone attached to them, predominantly chondral. Due to the size and location of the chondral defect, the appearance of healthy fragments, and the age of the patient, the authors decided to reduce and secure the detached cartilage to the surface of origin.

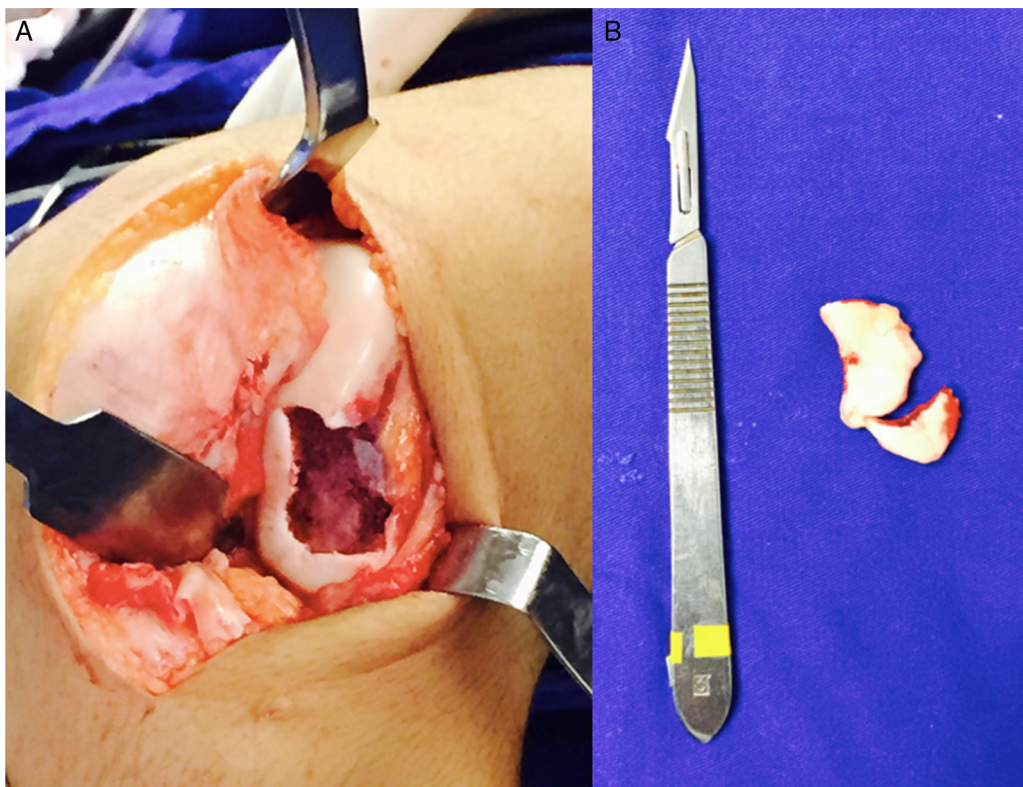
The soft tissue at the fracture site was debrided. As loose cartilage in the joint became swollen in contact with the synovial fluid, the fragment exceeded the size of the lesion. Therefore, it was cut to match the surface of the injury. The fragment was secured with transosseous sutures and PDS II suture stitches (polydioxanone, Ethicon), and its borders were sealed with fibrin glue (Fig. 3).

Patellofemoral instability correction was performed in a second surgery, in order to reduce the risk of joint stiffness, since the chondral suture requires a prolonged immobilization.

Postoperatively, the knee was maintained in extension with use of an immobilizer brace for four weeks, and weight-bearing was not permitted for six weeks. After four weeks,



**Fig. 1 – A, coronal view showing the loose bone fragment in the joint, coming from the femoral condyle; B, axial view showing the shallow trochlea and increased patellar tilt.**



**Fig. 2 – A, chondral injury of the femoral condyle weight-bearing area; B, osteochondral fragments with a minimal amount of bone attached to them.**

motor physical therapy was initiated to gain range of motion. At the third postoperative month, the patient presented a limited range of motion (0–60°) and did not progress further, despite adequate physical therapy. Therefore,

arthroscopic joint release and knee manipulation were indicated.

Prior to surgery, a control MRI was performed to check fragment integration. The examination indicated good





**Fig. 3 – Final result after the chondral fragment was sutured.**

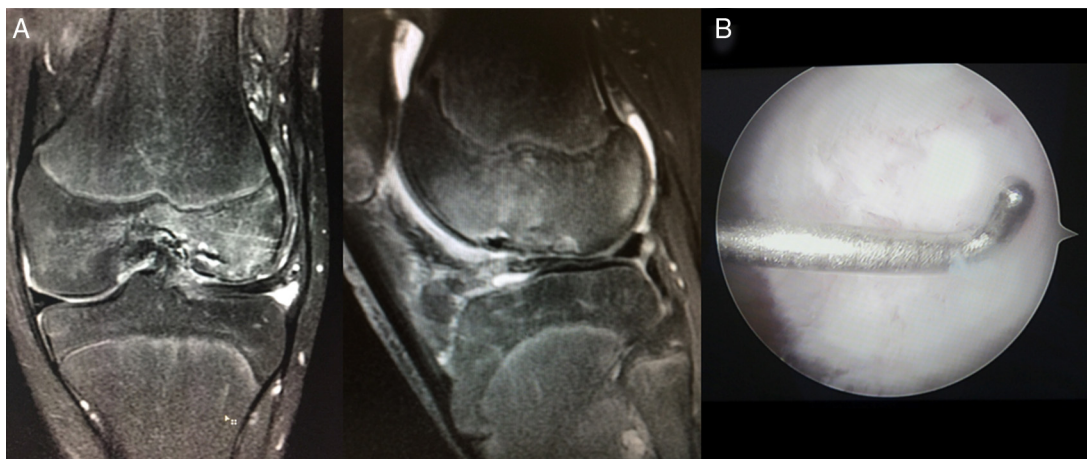
congruence of the articular surface and no fluid between the fragment and the femoral condyle, suggesting adequate integration (Fig. 4A and B). During the procedure, fibrosis was removed from the suprapatellar recess and an intraoperative range of motion of 0–140° was reached. Upon cartilage inspection, it was observed that most of the fragment was stable and congruent with the rest of the condyle. The most anterior portion of the lesion was degenerated, with an area of 1.0 cm<sup>2</sup>. As it was outside the weight-bearing area, in the transition with the trochlea, the remaining lesion was not addressed (Fig. 4). Motor physical therapy for range of motion gain and muscular

strengthening was initiated in the immediate postoperative period.

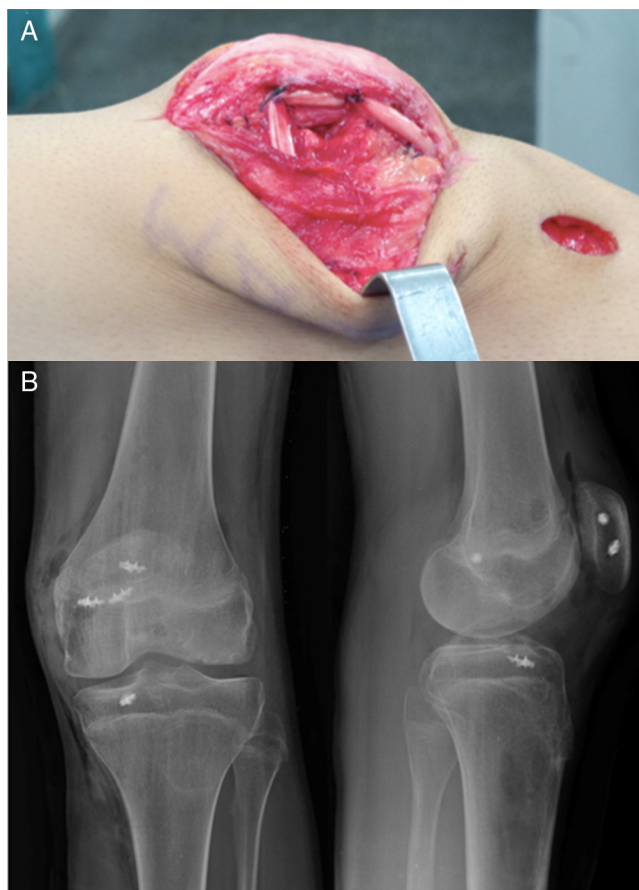
Six months after the arthroscopic release (nine months after the first procedure), the patient had no complaints of pain, presented no edema or knee crackling, and had an active range of motion of 0–140°, but the complaint of patellofemoral instability persisted. No other episodes of dislocation were reported, but the patient did not feel confident to perform rotation movements. On physical examination, he presented an inverted J-sign, patellar apprehension, abnormal patellar glide and tilt tests, and pain upon patellar compression and quadriceps contraction. In addition to the altered physical examination, some risk factors for developing patellofemoral instability were also present, such as: increased TT-TG distance (26 mm); patellar height of 1.4, as determined by the Caton-Deschamps index; shallow trochlea; and patellar tilt of 30°.

The patellofemoral instability was then corrected. As the physis were still open, the authors chose to stabilize the joint without bone procedures. The authors proposed to reconstruct the patellofemoral and patellotibial medial ligaments using an autologous graft. The technique and indication were in line with those previously published by the authors.<sup>10</sup>

First, the graft was collected through a small traditional anteromedial access, and the gracilis tendon was removed. The joint was accessed through a medial parapatellar approach, through which it was possible to visualize the chondral reinsertion site. The chondral cover was restored to approximately 80% of the original lesion, maintaining a chondral defect of about 1.0 cm by 0.5 cm on the most anterior portion of the condyle and outside the weight-bearing area. As the patient was asymptomatic, the authors chose not to intervene. Ligament reconstruction was performed with fixation of the gracilis with the aid of anchors on the medial aspect of the patella at two distinct points,<sup>10</sup> one for the MPFL and another for the MPTL. The graft extremities were fixed by anchors on the femur and tibia, respectively. The ideal anatomical site for each of them was determined with the use of fluoroscopy (Fig. 5). The fixation site was defined as described by Hinckel et al.<sup>10</sup> as the insertion point on the distal epiphysis of the femur and at a point immediately above the physis of the tibia,



**Fig. 4 – A, magnetic resonance with good radiological consolidation of the sutured fragment; B, video arthroscopy showing the fragment.**



**Fig. 5 – A, reconstruction of the patellofemoral and medial patellotibial ligaments; B, final radiographs after ligament reconstruction.**

at 20–25° from the patellar tendon. After wound closure, the knee was immobilized in extension for six weeks; immobilization was removed during the physical therapy sessions, without weight-bearing restrictions, for range of motion gain.

Currently, 16 months after the initial injury, the patient does not present pain or instability, is able to walk without difficulty and to perform all daily activities, including the sports activities practiced prior to the injury, and has a full range of motion (0–140°). The Kujala and Tegner scores presented very satisfactory results, improving from 55 to 94 and from level 3 to level 7, respectively.

The one-year postoperative MRI demonstrates the same image of chondral continuity and no signs of necrosis or lysis between the sutured cartilage and the condyle (Fig. 6).

## Discussion

Among the indications for surgical treatment of primary patellar dislocation, the only one considered absolute is the presence of a chondral or osteochondral injuries with a free articular fragment.<sup>11</sup> The injuries are most often located on the patella and trochlea.<sup>3</sup> In some cases, they may also be observed in the weight-bearing area of the lateral femoral

condyle in positions of greater flexion, and they are three times more frequent in boys.<sup>4</sup>

Therefore, when treating these patients, the orthopedist must be used to performing surgeries for patellar instability and cartilage injuries. This is a particularly difficult challenge in Brazil, where the options for chondral defect repair are limited. Currently, extensive commercial cell culture therapies, such as autologous chondrocyte transplantation, are not available in the country.<sup>12</sup> The availability of allogeneic transplantation<sup>13,14</sup> and collagen membranes is also limited. The instruments for autologous osteochondral transplantation are not available in most centers of the Brazilian Unified Health System. Microfracture, despite being widely available and inexpensive, presents unsatisfactory results in more extensive lesions (>2 cm<sup>2</sup>) and in the patellofemoral joint.<sup>15,16</sup>

Thus, the difficulty encountered by the authors has certainly been repeated in many countries or regions in which the full arsenal of chondral lesion treatment is not available. This case report presented a very reasonable alternative for specific situations, with very low cost and no need for special instruments.

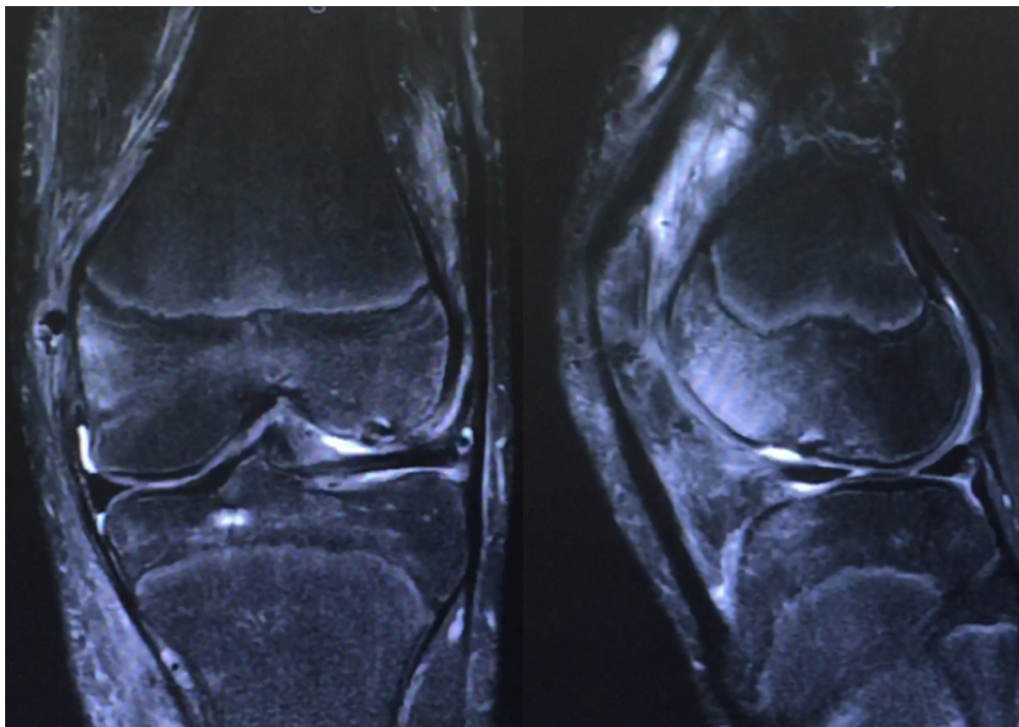
No studies in the literature present the results of direct chondral suture, nor the integration of sutured cartilage to the subchondral bone. In light of these facts, the present procedure is only justifiable in situations of a high theoretical probability of integration and greater viability of the chondrocytes. Therefore, based on their own experience, the authors believe that direct suture should be considered in cases that meet all of the following criteria:

- pure complete chondral or osteochondral lesion without sufficient bony support for traditional rigid fixation with screws;
- located in the femoral or patellofemoral tibial weight-bearing area;
- lesion greater than 1 cm<sup>2</sup>;
- acute lesion with less than three weeks of evolution;
- traumatic lesion;
- appropriate surface for fixation (healthy bone) and viable cartilage aspect;
- young patient (less than 20 years of age).

Regarding the surgical technique, the suture used should be preferably absorbable and its stiffness should be maintained for the longest possible time. This is why the PDS II (Ethicon) was chosen, as it maintains the resistance for longer than Vicryl (Ethicon). The suture can be facilitated with delicate Kirshner wires for perforation at the edges of the lesion to allow to pass the needles through the bone. As the sutures are absorbable, they can be left on the chondral surface. Fibrin glue may help to stabilize the fragment. The authors suggest a few weeks of immobilization, as this fixation is not very stable; this may increase the risk of arthrofibrosis and the need for manipulation and arthroscopic release during follow-up. The exact period should be individualized based on stability, patient age, patient confidence, and adherence to medical recommendations.

In this case, the authors also used MPTL reconstruction in the treatment of the patellar instability, in addition to the





**Fig. 6 – Current magnetic resonance, demonstrating good radiological integration of the fragment.**

traditional MPFL reconstruction. The authors believe that the additional stabilization provided by the MPTL is helpful in cases of young patients with open physis with important bone risk factors that cannot be corrected before the end of growth (trochlear dysplasia, patella alta, and increased Q angle). The technical options described use either the quadricipital and patellar tendons as grafts or the flexor tendons. In this case, the gracilis tendon was used, because as the quadricipital tendon had already been violated during the previous arthrotomy, the authors believed it would present scarring and therefore would not be suitable for this procedure. The positioning of the femoral and tibial insertions used in the present study, as well as the knee positioning and tension for its fixation, were those described by Hinckel et al.<sup>10,17</sup>

Although total integration of sutured cartilage was not observed, the total area was reduced to a lesion with better treatment options if necessary. When considering the age of the patient, reducing an injury from 3 cm extension to 1 cm with autologous hyaline cartilage is desirable. The residual area is in the transition between the weight-bearing area of the lateral femoral condyle and the trochlea, a region that is not very symptomatic; it is even used for the removal of osteochondral cylinders for autologous osteochondral transplantation. Although the recommendation is still to use rigid fixation with implants for osteochondral injuries, the absence of sufficient subchondral bone, in this case, led the authors to use direct suture.

The excellent functional outcome of the patient motivated the present report; the authors aimed at presenting a technical alternative that can be considered in the special situations described.

## Conclusion

Acute fixation through direct bone suture of a purely chondral fragment may be considered in special situations, especially in young patients in whom it is desired to avoid resection of the fragment due to lack of technical options for a rigid fixation.

## Conflicts of interest

The authors declare no conflicts of interest.

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