CASE REPORT

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Clinical and morphological aspects of lateral femoral condyle status after an osteochondral fracture. A case report

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Abstract

Although osteochondral fractures of the lateral femoral condyle are uncommon, fixation of the fragments is recommended, mostly when is about young athletes with such post-traumatic pathology. We present a case of a professional handball player teenager female, with a lateral femur condylar osteochondral fracture after a fall with the right knee in extension and in internal rotation. Magnetic resonance imaging (MRI) showed an osteochondral fracture of the lateral femoral condyle, 34.6 mm on long axis, impossible to manage arthroscopically, because of the size and the location of the detached fragment. The solution was the lateral knee arthrotomy allowing the evacuation of the hemarthrosis and preparation of the fracture site, then reduction and fixation of the fracture with absorbable cannulated pins. This procedure is of choice only when is enough bone in the detached fragment to permit the internal fixation and bone-to-bone healing with cartilaginous tissue stabilization through the fibro-cartilaginous rim that would seal the cartilage surface. Postoperative MRI proves that the fragment is settled in its hooked position with repairing of the articular congruity, so the recovery exercises program allow the regaining of the knee mobility with a restart of her sportive activity later.

Keywords: femoral condyle, osteochondral fracture, patellar dislocation, arthrotomy, bone-to-bone healing.

Introduction

The knee joint is not only the largest and highly important joint in the human body, but also one of the most complicated. Preserving its morphological integrity is essential, because the knees bear the brunt of every move we make throughout our lives (from simple walk until performance sport).

Osteochondral acute fractures of the lateral femoral condyle are rare injuries that usually affect young active adults [1, 2]. Patients commonly have a history of trauma and pursue for a specialized consult presenting severe pain and restricted movements. Acute osteochondral fracture of the knee is not always easy to diagnose. They continue to be a challenging problem, especially in younger patients [3]. The orthopedic references are abundant for the cases of acute patellar traumatic dislocation associated with patellar and lateral femoral condyle injuries. In the past, the resulting post-traumatic osteochondral fragments were surgically removed, except those cases with enough remnants of the subchondral bone to anchor those fragments [4].

There are authors that recommend therapeutic rules for the removal of osteochondral fragments or a conservative approach when large osteochondral fragments are involved [5].

Depending of the fracture site, position and the size of the osteochondral fragment, this pathology can be surgically repaired using the arthroscopic tools. The procedure is minimal invasive, but surgeons must be well prepared [6].

The classic approach can damage the function of the postoperative knee joint but sometimes it is the only method for treating these fractures. There are published studies that support the use of the open reduction and internal fixation for osteochondral condylar fractures of the knee joint [7].

This article is a case report involving a young patient with a recent osteochondral fracture of the lateral femoral condyle, who went through an open reduction and fixation with absorbable cannulated screws.

Case presentation

We will present here the case of one 17-year-old female, a professional handball player with a lateral condylar osteochondral femur fracture after a fall with the right knee in extension and in internal rotation.

At physical examination, the patient presented a globulous knee, large effusion, tenderness of the knee joint, impossible activity of knee, the knee being blocked in semi-flexion, negative McMurray sign, and negative Lachman test result (these tests were very difficult to perform).

The X-rays presented a loose body within the central compartment of the right knee (Figure 1). We decided to perform a magnetic resonance imaging (MRI) (Figure 2) and a computed tomography (CT) scan (Figure 3) to establish correctly the size, position and gravity of the lesion.

MRI documented an osteochondral fracture of the lateral femoral condyle. The size of the missing bony substance was of 34.6 mm, which was identified in the central of the knee joint and slightly lateral.

The surgical intervention consisted of an arthroscopy that proved the fact that the arthroscopic fixation of the osteochondral fragment was impossible due to the size and site of the fragment. With the informed consent of the patient, a lateral approach arthrotomy was performed followed by evacuation of the hemarthrosis, preparation of the fracture site, reduction and fixation of the fracture with absorbable cannulated pins (Figure 4).

Postoperative X-ray pictures certified that the fragment was stable in its reduced position, and the recovery of the articular coherence was proven by follow-up MRI at six weeks postoperative (Figure 5) and one year postoperative (Figures 6 and 7) with the informed consent of the patient.

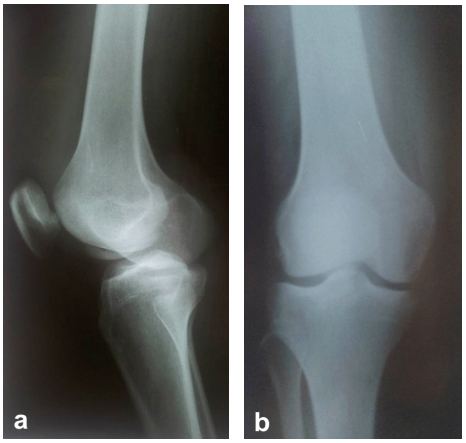


Figure 1 – *(a) Lateral and (b) anteroposterior X-rays performed before surgery. Visual signs of the chondral damage can be seen on the first X-ray, but they seem to not be visible on the anteroposterior one.*

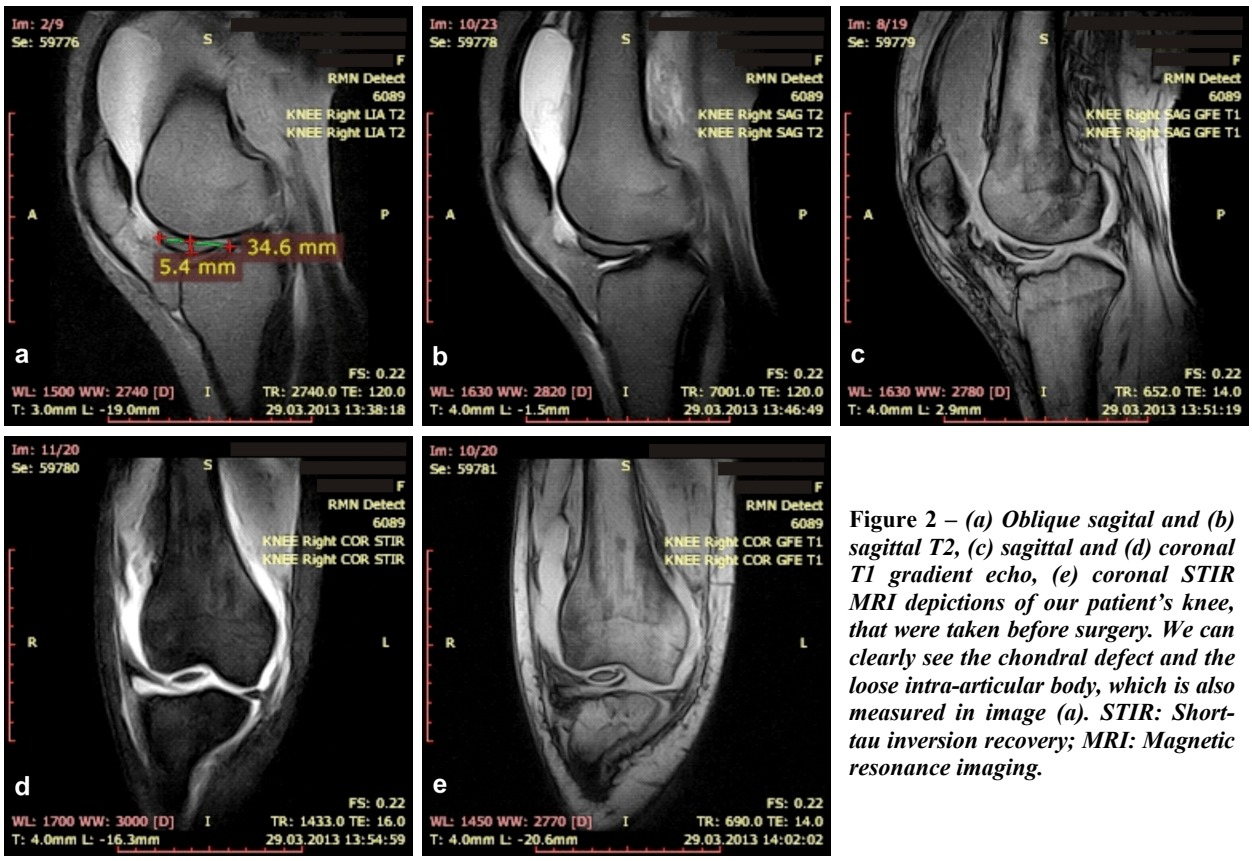
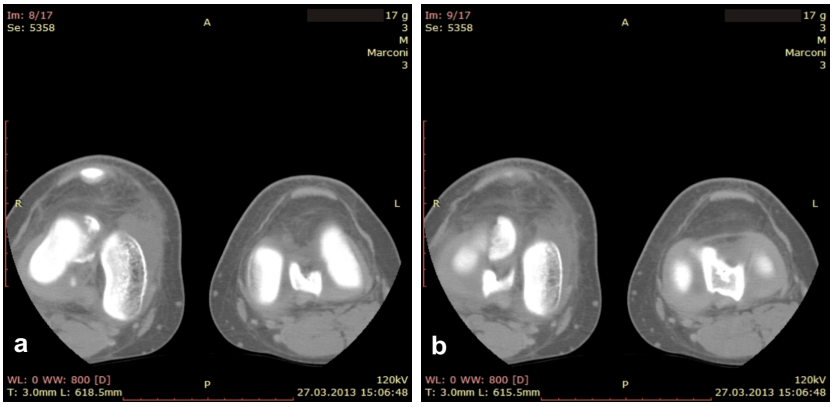


Figure 2 – *(a) Oblique sagital and (b) sagittal T2, (c) sagittal and (d) coronal T1 gradient echo, (e) coronal STIR MRI depictions of our patient's knee, that were taken before surgery. We can clearly see the chondral defect and the loose intra-articular body, which is also measured in image (a). STIR: Short-tau inversion recovery; MRI: Magnetic resonance imaging.*

Figure 3 – *CT slides that also point out the piece of cartilage inside the knee, proximal to the condyles (a) and distally from them (b). CT: Computed tomography.*



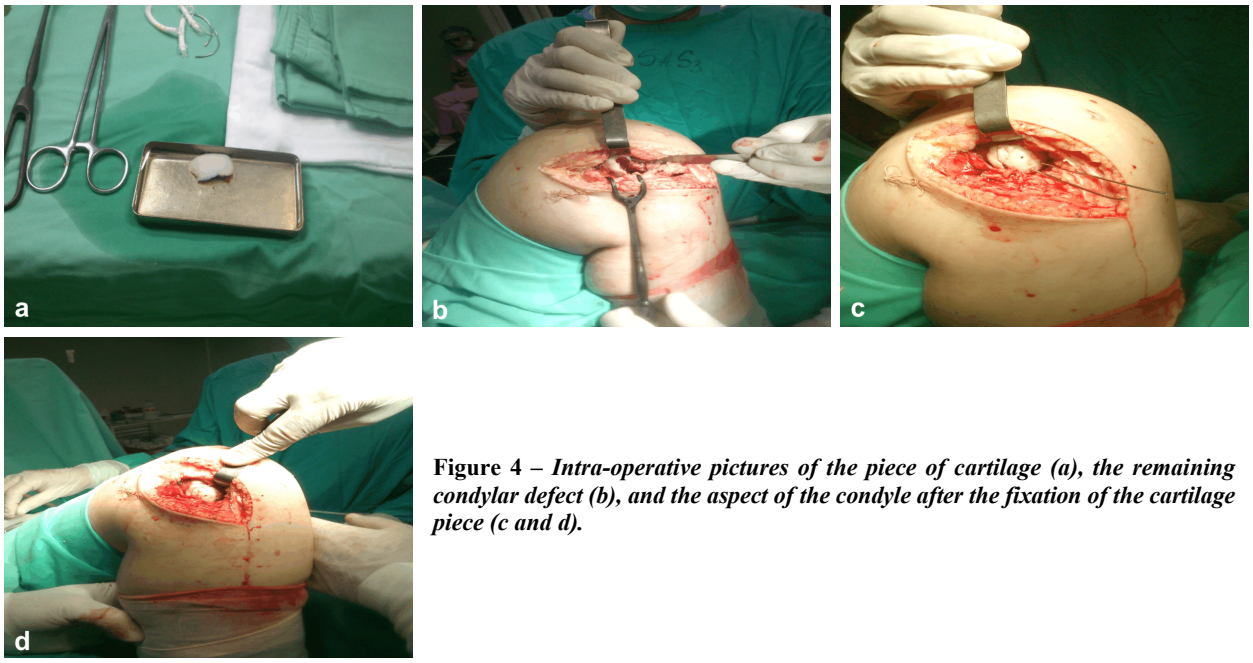


Figure 4 – *Intra-operative pictures of the piece of cartilage (a), the remaining condylar defect (b), and the aspect of the condyle after the fixation of the cartilage piece (c and d).*

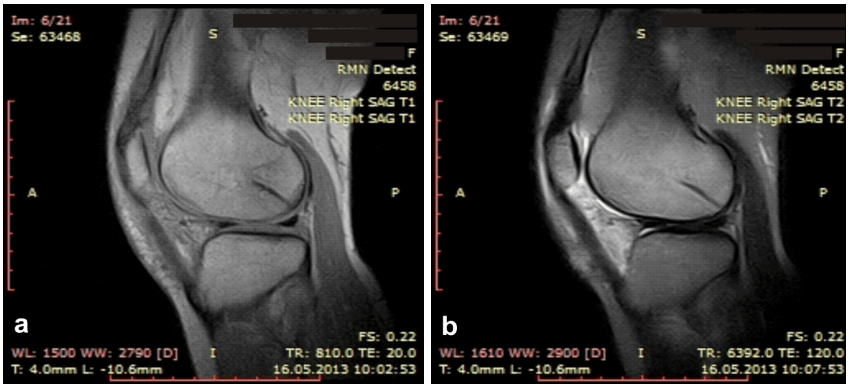


Figure 5 – *MRI pictures at six weeks post-operative: sagittal T1 (a) and sagittal T2 (b). MRI: Magnetic resonance imaging.*

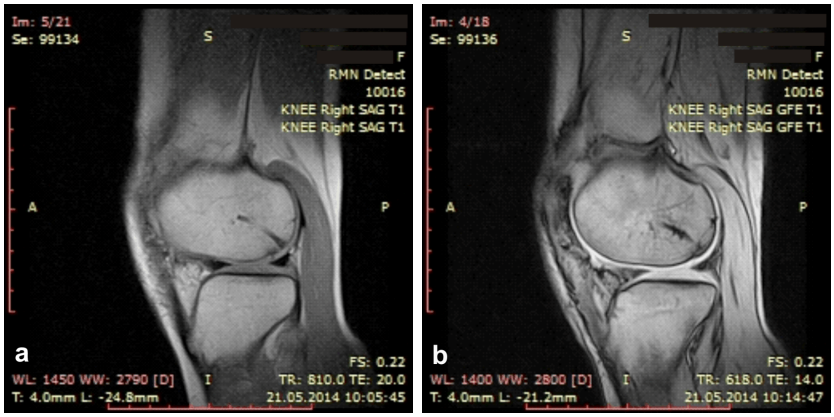


Figure 6 – *One year post-operative sagittal T1 (a) and sagittal gradient echo T1 (b) MRI pictures. MRI: Magnetic resonance imaging.*

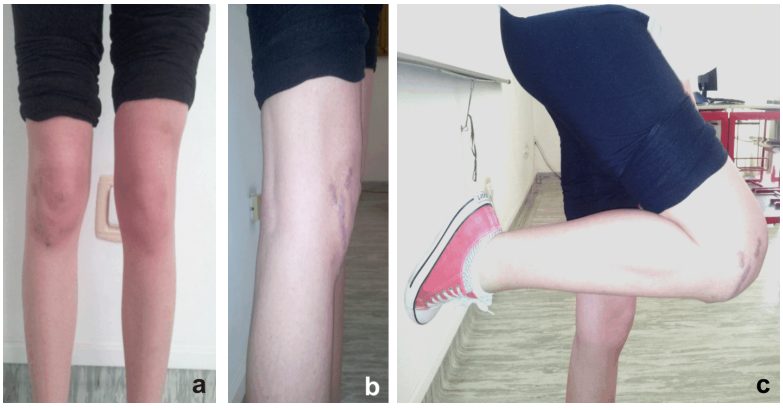


Figure 7 – *Frontal (a) and lateral (b) post-operative pictures with the knee in full extension and with the knee in a greater than 90° flexion (c), one year after the surgery occurred.*

Discussions

The traumatic osteochondral fractures of the distal femoral are rare injuries, compared to other traumatic lesions of the femur. These lesions are consequences of a shear moment produced when the hyperextended knee exposed the distal femur against the tibial plateau [3, 8]. For the correct diagnosis, MRI is the preferred study to evaluate osteochondral injury [9, 10]. For the bone remnants attached to the fragment, of more use are X-rays or CT.

A recent fracture must be discriminated from *osteochondritis dissecans* (OCD) by the trauma-related event, because the resulting fragments are suitable for fixation methods [11].

It is overall accepted that chondral injuries with tissue loss are a challenge to be managed. The latest studies confirm that the innovative techniques are a choice for obtaining the repair with improvement of clinical results. However, as in other domains 100% consensus in favor of a single method is not possible [12, 13].

Because a number of factors must be considered when a surgical method is chosen for the acute post-traumatic focal chondral defects, such as: the defect size, the knee alignment, older/chronic knee defects, the patient's age and activity level and the surgical risk [14, 15]. Concomitant, yet older lesions of the same knee or malalignment should be solved before the surgery for the joint cartilage recovery is initiated [16–18]. A wide range of methods to reach this aim was tested, the appropriated treatment being based on: indications, surgical technique, recovery of joint mobility, possible complications [19].

Historically, such fragments were treated by excision, but for the acute traumatic injury, the fixation of the fragments can have good results, because is possible to reestablish the contiguous surface with the viable cartilage by fixation of the fragment [20, 21].

It is well known that *in vivo* chondrocytes have a low mitotic rate so the articular cartilage defects have a deficiency in self-healing. Being detached, together with underlying bone, it is prone to necrosis. Hence, the mandatory need to restore its anatomical place, with minimum abrasive methods. Internal fixation requires enough bone within the osteochondral fragment; without such a bony scaffold, the articular cartilage cannot be reintegrated in to the femoral condyle. Bone-to-bone fusion provides the appropriate stability of the cartilaginous cap and a fibro-cartilaginous rim may completely seal the cartilage surface. Screw or pin fixation are the technical possibilities for the management of these lesions [21].

The advantage of using specially designed pins for the fixation procedure is that they permit postoperative MRI by being bio-absorbable. When multiple pins are used, rotational stability may be achieved, but compression of the lesion is impaired. The use of screws allows immediate compression and rotational stability if more than one screw is used [7]. Postoperatively, the patient can begin the protocol of recovery therapy and perform follow-up CT scans or MRI.

Fragmentation of smaller osteochondral lesions is one of the complications that are possible during screw insertion. Another complication of screw fixation is abrasive damaging of the articular surface [7].

Another method of fixation is the suture bridge fixation technique that combines the principles of lesion compression, immediate stability allowing range of motion, an absence of abrasive implants, and the possibility to perform postoperative MRI [4].

In the last 50 years, reduction of post-traumatic OCD fragments, if remain intact, followed by rotation and stable fixation with compression, is considered the optimal treatment [6, 22, 23]. Biodegradable devices provide the possibility to repair these conditions with a single procedure, avoiding the removal of implants.

Conclusions

For treating an acute chondral fracture of the lateral femoral condyle, the use of absorbable pins and screws can be the ideal treatment with very good results. This depends on the size and site of the osteochondral fragment. Arthroscopically fixation of the fragments has its limits and the open fixation can be the treatment of choice.

Conflict of interests

The authors declare that they have no conflict of interests.

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