

# Arthroscopic Fixation of an Atraumatic Osteochondral Defect of the Knee: A Case Report

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## Learning Point of the Article:

This case report highlights the successful use of ARIF in treating a unstable osteochondral defect in a young, healthy patient, underscoring the importance of considering this diagnosis even in the absence of trauma.

## Abstract

**Introduction:** Osteochondral defects cause significant loss of articular cartilage and subchondral bone, often leading to osteoarthritis if untreated. Early diagnosis and intervention are crucial to prevent degenerative joint disease. This case report documents the first successful use of arthroscopic reduction internal fixation for an atraumatic osteochondral defect in a young, healthy individual, demonstrating the potential of this minimally invasive approach.

**Case Report:** A 27-year-old Hispanic male with no significant medical history presented with restricted left knee extension and occasional locking after recreational swimming. Physical examination showed tenderness along the knee borders, a positive varus stress test, and limited extension. Imaging studies identified a large, unstable osteochondral lesion in the lateral femoral condyle. Arthroscopy confirmed the defect, measuring approximately 4.5 cm × 1.5 cm, and fixation was performed using three headless compression screws. Post-operative recovery was smooth, with the patient regaining full functionality within 3 months and excellent outcomes at the 2-year follow-up visit.

**Conclusion:** This case highlights the importance of considering osteochondral defects in young patients with knee pain, even without trauma. The successful use of ARIF for a large, atraumatic osteochondral defect demonstrates the efficacy of minimally invasive techniques in treating such lesions. We underline the importance of maintaining a high index of clinical suspicion for this diagnosis in young patients presenting with knee pain.

**Keywords:** Osteochondral defect, arthroscopic reduction internal fixation, atraumatic knee injury, osteoarthritis, minimally invasive surgery.

## Introduction

Osteochondral defects (OD) are the articular loss of cartilage and subchondral bone, often arising from acute trauma [1, 2, 3]. These injuries can occur in up to 36% of the population and are commonly linked to osteochondral fractures and anterior cruciate ligament injuries [4, 5]. Untreated cartilage injuries can lead to osteoarthritis (OA), which is the 15th highest cause of

years lived with disability worldwide [6, 7]. The United States' direct medical costs of OA are estimated at \$72 billion [8]. Early diagnosis and treatment of ODs are crucial to prevent the development of degenerative joint disease and reduce the associated socioeconomic burden [9].

Patients with symptomatic OD typically present with nonspecific knee pain and swelling [10]. Knee ODs can be

## Author's Photo Gallery



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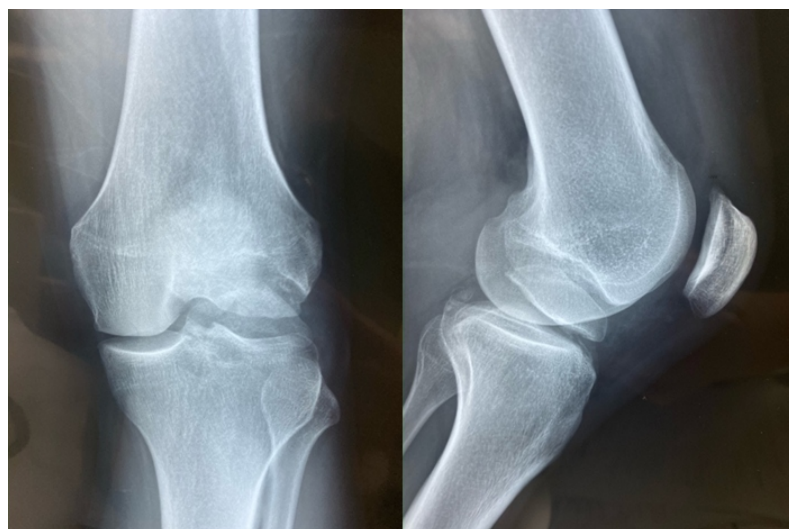
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**Figure 1:** Anteroposterior and lateral views of the left knee showing a large, loose body over the lateral femoral condyle.

diagnosed either by magnetic resonance imaging (MRI) or at the time of knee arthroscopy [11]; previous studies have reported a prevalence of articular cartilage pathologies of 66% in arthroscopic knee procedures [12, 13, 14]. The frequency of diagnosed articular cartilage defects is increasing due to the greater use of MRI and the higher accuracy of newer imaging techniques [15, 16]. Numerous surgical procedures are available for treating these injuries, including fragment excision, arthroscopic reduction internal fixation (ARIF), and other cartilage restoration or replacement modalities [17].

Fixing unstable osteochondral fragments involves restoring the native hyaline articular surface and repairing the subchondral bone [5, 18]. Despite advancements, effectively managing substantial osteochondral lesions remains complex [19]. Rak Choi et al. found satisfactory clinical and radiological outcomes using internal fixation for ankle ODs, and other studies have noted similar success utilizing ARIF for acute traumatic knee chondral lesions [18, 20, 21]. However, to the best of our knowledge, there is scarce literature regarding the outcomes of patients undergoing ARIF for atraumatic knee ODs.

We report the case of a 27-year-old male successfully managed with ARIF after developing an atraumatic OD in the lateral femoral condyle. We obtained written consent from the patient to use his de-identified medical information.

### Case Report

A 27-year-old Hispanic male with no significant medical history visited our orthopedic sports medicine clinic, reporting restricted left knee extension and occasional locking while walking. Despite these issues, he could manage his daily activities with slight difficulty. The symptoms began a month prior during recreational swimming. The patient had limited

access to obtaining a medical appointment with the orthopedic surgeon, which prolonged the evaluation process from symptom onset.

During the initial evaluation, the patient complained of discomfort in the lateral aspect of the left knee. He presented tenderness along the medial and lateral borders during the physical examination, a positive varus stress test, and a limited extension at 10°. No edema or crepitus during movement were appreciated. In addition, McMurray, Lachman's, anterior drawer, posterior drawer, and patellar ballotment tests were negative.

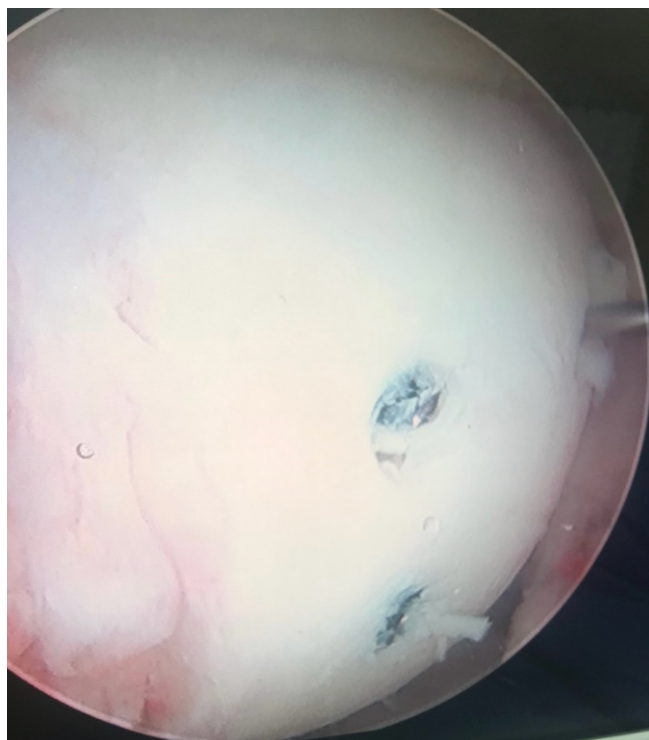
Radiographs of the left knee revealed a large, loose body at the lateral femoral condyle (Fig. 1). MRI shows a large osteochondral lesion involving the posterior aspect of the lateral femoral condyle with fluid signal intensity at its base, compatible with a detached unstable OD lesion rotated 180° on its long

axis (Fig. 2). After discussing treatment alternatives, he opted for surgical management based on his clinical and imaging findings. Arthroscopic exploration through the anteromedial and anterolateral portals confirmed the MRI findings. The defect, measuring approximately 4.5 cm × 1.5 cm (i.e., 20.3 cm<sup>2</sup> × 2.3 cm<sup>2</sup>), was approximated using an arthroscopic probe with a 5-mm wide tip, and inverted 180° in the sagittal plane over the lateral femoral condyle (Fig. 3). The donor autograft fractured cartilage defect was fully debrided with the shaver, while the recipient site was freshened with the shaver to achieve a clean



**Figure 2:** Sagittal view of a fluid-sensitive fat-saturated T2 magnetic resonance imaging of the left knee demonstrating a large osteochondral lesion involving the posterior aspect of the lateral femoral condyle with fluid signal intensity at its base, compatible with a detached unstable osteochondral defects lesion rotated 180° on its long axis.

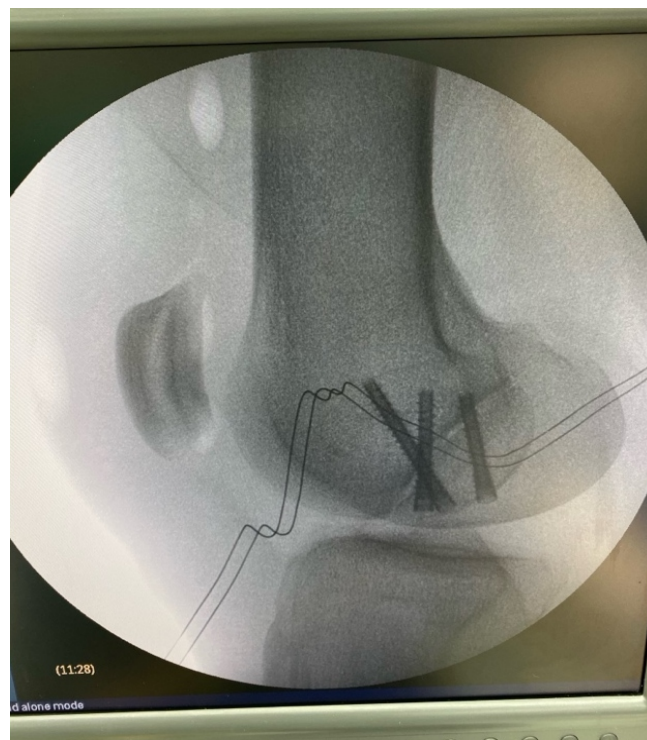




**Figure 3:** Intraoperative images demonstrating the fixed defect, measuring approximately 4.5 cm × 1.5 cm, and inverted 180° in the sagittal plane over the lateral femoral condyle.

and viable surface for fixation. Later, microfracture technique was used to enhance the healing potential of the osteochondral fragment. The fragment was reduced and pressed against the recipient site with guidewires for temporary fixation. Then, three additional guide wires were placed perpendicular to the fracture line and after verifying the guidewire direction with fluoroscopy, we drilled the cortex of the fragment and inserted the compression screws. The internal fixation was performed using three Acutrak 3.5 mm Headless Compression Screws (Acumed, Oregon, United States). Anatomical reduction was confirmed through intraoperative arthroscopic examination and intraoperative radiography (Fig. 4). No abnormalities of the cruciate ligaments, menisci, or patella were noted during the evaluation.

The patient was discharged the same day without complications. The surgeon advised the patient to use a hinged-knee brace for the 1st-month post-surgery, gave instructions to limit weight-bearing with a gradual increase over subsequent months, and scheduled visits with an outpatient physical therapist. At his first follow-up, he experienced minor pain while ambulating and reported a complete resolution of symptoms at the 3-month visit. At the 2-year follow-up visit, the radiographs revealed proper OD healing (Fig. 5). The surgeon recommended the removal of hardware; however, the patient was happy with his results and opted for no further surgery fearing detriments in his excellent clinical outcomes.



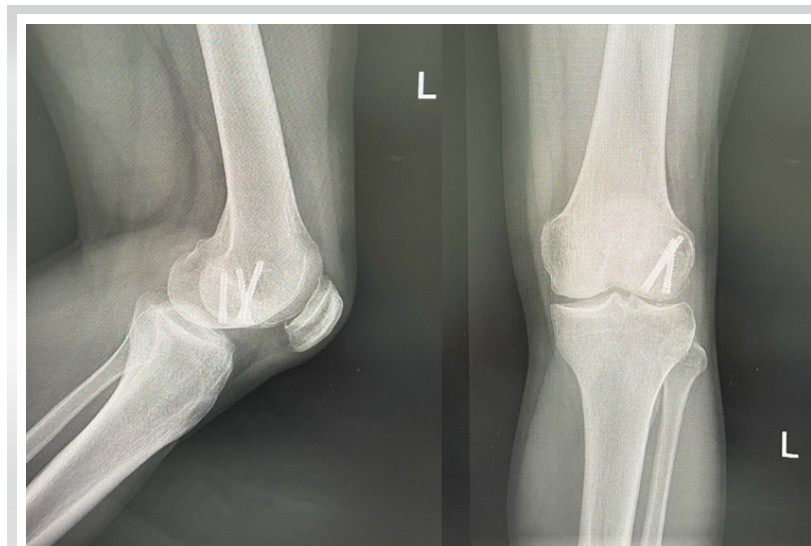
**Figure 4:** Anatomical reduction of the osteochondral defect using three headless compression screws confirmed through intraoperative radiography.

## Discussion

We described a unique case of a young healthy male with an OD of the left knee following recreational swimming, effectively managed with ARIF. The outcomes highlight the innovative role of a minimally invasive approach for managing atraumatic large chondral lesions.

While recreational swimming is considered a low-impact activity, instances like these often stem from trauma, chronic repetitive strain, or conditions such as osteochondritis dissecans [22, 23]. Patellar dislocations also pose a risk, potentially causing fractures when the patella impacts the lateral femoral condyle [24, 25]. The description of large ODs occurring in atraumatic settings is poorly described in the literature, potentially leading to a delayed diagnosis due to low clinical suspicion with young patients presenting with knee pain.

The pre-operative radiographs showed a full-thickness cartilage defect with subchondral bone involvement, representing a sizeable loose body, consistent with a Grade 4 of the International Cartilage Repair Society classification system, a validated and reliable tool for diagnosing the depth of cartilage lesions [26,27]. While radiographs are the initial imaging diagnostic test for assessing such injuries, MRI is the gold standard modality [23,28]. In our case, MRI findings concurred



**Figure 5:** Anteroposterior and lateral X-rays of the left knee showing a properly healed fragment with three headless compression screws.

with arthroscopic findings, showing a large osteochondral fragment inverted 180° in the sagittal plane over the lateral femoral condyle.

Several knee procedures treat chondral injuries, including microfracture, platelet-rich plasma (PRP), and arthroscopic reduction and internal fixation [17]. Microfracture is a bone-marrow stimulation and is commonly used for small (<2 cm<sup>2</sup>) chondral lesions but unsuitable for large defects or those extending into the subchondral bone [29]. A review published by Elghawry et al. found that PRP may show clinical benefits in osteochondral lesions of the talus, yet the MRI findings of chondral regeneration are inconsistent [30]. Similarly, Woo et al. evaluated the use of PRP combined with microfractures for talus OCDs compared to microfracture only [31]. They found a significant difference in several patient-reported outcome measures (i.e., visual analog score and the foot and ankle ability measure scores) [31]. Yet, limited studies have extended the evaluation of PRP and autologous blood or bone as adjuvant treatment for large OCDs [32, 33]. For instance, Rajeev et al. found that autologous conditioned plasma injections provide short-term clinical benefits for symptomatic OCDs of the knee [32]. Whereas Li et al. found that PRP scaffolding combined with osteochondral autograft transfer is a suitable alternative for femoral condyle full-thickness articular cartilage defects, improving the knee function and quality of life of 86% of their cohort and complete regeneration on MRI on all the included patients [33]. Yet, no consensus exists on the optimal management [34]. Factors like age, activity level, and lesion characteristics guide surgery [17]. For instance, Andriolo et al. found that patients with osteochondritis dissecans lesions larger than 1.2 cm<sup>2</sup> or unstable lesions have poor prognosis following conservative management [35]. Studies show that

arthroscopic fixation yields better outcomes than allograft transplantation [36,37].

Various fixation methods exist, such as Kirchner wires, compression screws, and bioabsorbable devices [17]. Limited studies compare these methods, but the latter two show acceptable rates of radiographic healing (82% with metal headless compression screws and 67% with bioabsorbable devices) [38, 39]. In addition, Leland et al. reported excellent rates of radiographic union and improved patient-reported outcomes following internal fixation of osteochondritis dissecans [40]. Surgical fixation is also preferred over loose body extraction in cases of large fragments to avoid early-onset OA [41].

Despite delayed presentation and management, the patient had excellent outcomes. This case marks the first description of a previously healthy and young

patient presenting with a large, unstable OD that occurred in an atraumatic setting managed successfully with ARIF. The clinical outcomes were excellent, and the patient regained full functionality within 3 months. Our results highlight the importance of high clinical suspicion in patients with knee pain without evident traumatic causes.

## Conclusion

This report demonstrates the rare occurrence of a large and unstable OD of the lateral femoral condyle in an atraumatic setting. Our report demonstrates ARIF as an adequate surgical technique for these significant defects. We underline the importance of maintaining a high index of clinical suspicion for this diagnosis in young patients presenting with knee pain.

## Clinical Message

This case report emphasizes the successful management of a large, atraumatic osteochondral defect of the lateral femoral condyle in a young, healthy patient using ARIF. It highlights the importance of considering osteochondral defects in patients presenting with knee pain even in the absence of trauma and demonstrates the potential of minimally invasive techniques in achieving excellent clinical outcomes. By sharing this unique case, we aim to enhance clinical awareness into the diagnosis and treatment of similar conditions, ultimately contributing to improved patient care and outcomes in orthopedic sports medicine practices.

**Declaration of patient consent:** The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

**Conflict of interest:** Nil    **Source of support:** None

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