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# Osteochondritis Dissecans Development after Bone Contusion of the Knee in the Skeletally Immature: A Case Series

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# Osteochondritis Dissecans Development after Bone Contusion of the Knee in the Skeletally Immature: A Case Series

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## Abstract

Osteochondritis dissecans (OCD) is thought to be an acquired osteochondral disorder, and its etiology may be multi-factorial. Trauma, both acute and repetitive events, has previously been proposed as a potential cause for OCD development. We present two cases of skeletally immature males who developed a symptomatic OCD lesion following a femoral condyle bone contusion. These cases suggest that an acute traumatic event may lead to the development of OCD of the knee.

**Keywords:** Osteochondritis dissecans, bone contusion, knee, skeletally immature, cartilage injury

## Introduction

Osteochondritis dissecans (OCD) is thought to be an acquired osteochondral disorder, and its etiology may be multi-factorial. Fairbank proposed repetitive micro-trauma of the tibial spine onto the lateral aspect of the medial femoral condyle as a potential cause [6]. Trauma, both acute and repetitive events, as well as genetic factors may play a role in the development of this condition [4,7]. Several studies have suggested traumatic incidents as potential causative factors of OCD, although the relationship between higher energy and acute traumatic events is very limited [3,9,13,19].

Two cases are presented of skeletally immature subjects with a history of femoral condyle contusions that were initially identified on MRI sequences after significant knee trauma. In the follow-up period, both patients developed lesions consistent with OCD, suggesting that acute trauma may be one of the causes of OCD lesions.

## Case Report

IRB approval, consent, and assent were obtained for this report. Both patients and their families were informed that these cases were to be submitted for publication, and they gave consent for this.

Case 1. An 11 year-old male was referred to our clinic from the emergency department after he sustained a non-contact, "plant-and-twist" left knee injury playing football, and developed a large effusion. An MRI identified a minimally displaced tibial spine avulsion, and an acute bone contusion on the lateral femoral condyle (Fig. 1). Recent research on tibial spine fractures/avulsion injury has demonstrated a pattern of bone contusions similar to those seen with ACL tears [17,18]. The patient was treated with a cast for one month, and returned to regular activity within 3 months of the injury.

Approximately two years after this injury the patient returned to our clinic with pain under his patella and over the lateral aspect of his knee. The patient had no mechanism of injury to explain his onset of symptoms but had been active in sports. This pain had existed for approximately four months prior to his office visit and had limited him

significantly during exercise. He did not recall any recent trauma, and his symptoms developed spontaneously. Radiographs at this time were normal. An MRI of the knee revealed evidence of a small OCD lesion on his lateral femoral condyle, in a similar location to the acute contusion seen on the previous MRI (Fig. 1). The patient was restricted from playing sports for three months and was advised to limit activity.

At 3-month follow-up, AP and lateral radiographs and an MRI were taken. MRI showed complete resolution of the OCD lesion, with the articular cartilage intact. This resolution was approximately 2.25 years after the initial injury. The patient was released to a gradual return to sports without any restriction. At 2 years of follow-up, he remains asymptomatic.

Case 2. A 15-year-old hockey athlete sustained a right knee injury during a knee-to-knee collision with another player. Because of ongoing symptoms, he was evaluated with an MRI obtained several weeks after the injury. MRI identified a bone contusion of the medial femoral condyle (Fig. 2). A rehabilitation program was recommended and activity was continued without restriction.

Approximately 7 months later, the subject was still having significant pain and catching in this region accompanied by occasional difficulty in full leg extension. A secondary MRI was obtained, and a significant focal cartilage lesion was identified on the medial femoral condyle (Fig. 2). He was treated with subchondral bone drilling. At one-year follow-up, the subject's pain was completely resolved, and the radiographs were normal.

### Discussion

The most important finding of the present study was the possible correlation between femoral condyle bone contusion and osteochondritis dissecans development. Although the etiology of OCD has not fully been elucidated, it is commonly accepted that repetitive micro-trauma may play a significant role in the development of this disorder [3-7,12,21]. One hypothesis for a traumatic incident causing an OCD involves the tibial eminence causing a direct contusion on the medial femoral condyle [6]. Some have proposed repetitive trauma as a cause of OCD of the knee [3,6,21]. Fairbank suggested that repetitive trauma of the tibial spine against the femoral condyle can lead to OCD of the medial femoral condyle [6]. However, some have rejected this hypothesis due to its inability to account for OCD development in different joints and other locations in the knee [9,10].

In addition to repetitive micro-trauma, single, significant traumatic events may also play a role in the development of OCD. Krappel proposed a progression from a capitellar bone bruise to an OCD lesion of the elbow [13]. The two cases in this series suggest that a single traumatic event in the knee may lead to delayed development of a type of OCD lesion.

OCD lesions in juveniles have been shown to heal without surgical intervention [11,16,22]. However, recent reports have shown that those with stable or low-grade juvenile OCD lesions that do not heal with non-operative measures, may be treated successfully with subchondral bone drilling [23,2,1].

A recent MRI study showed that the largest proportion of bone contusions associated with tibial eminence fractures were associated with the lateral femoral condyle (80%), although subchondral bone contusions were seen frequently in other areas of the knee as well [17]. This study and others demonstrated that bone contusions are frequently found in skeletally immature patients with a history of a knee injury and associated effusion [8,14,15,17,20].

In these 2 knee injury cases, a single traumatic event may have produced contusions to the lateral femoral condyle. Both patients reported delayed-onset secondary symptoms after the condyle contusions, and the MRI demonstrated the appearance of lesion of the subchondral bone consistent with the development of OCD lesions. The etiology and progression of OCD is still unclear, and repetitive micro-trauma may still play a predominant role in the development of OCD. But, these cases with acute knee injury and evidence of an acute condyle injury in the region that subsequently developed an OCD, suggests that acute traumatic contusions may be another process that leads to the development of OCD. Future studies should be conducted to determine the relationship between subchondral bone contusions and OCD. These future studies could include a study that follows a large number of patients with femoral condyle bone contusions, prospectively, to assess if OCD lesions develop.

Although the etiology of OCD may still be multi-factorial, suggested etiologic factors have essentially been divided into several categories, including: trauma, vascular, and hereditary [3,4,6,21]. Inflammatory and vascular theories have fallen out of favor, as histopathology studies have not shown consistent signs of either inflammation or large-scale ischemia. Repetitive micro-trauma has received more attention in recent years as a primary cause of OCD [12]. In addition to repetitive micro-trauma, acute higher energy impact injuries may also be associated with the development of OCD. These cases suggest that an acute traumatic event may lead to the development of OCD of the knee.

#### **Conflict of Interest**

The authors declare that they have no conflict of interest.

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**Figure Legends:**

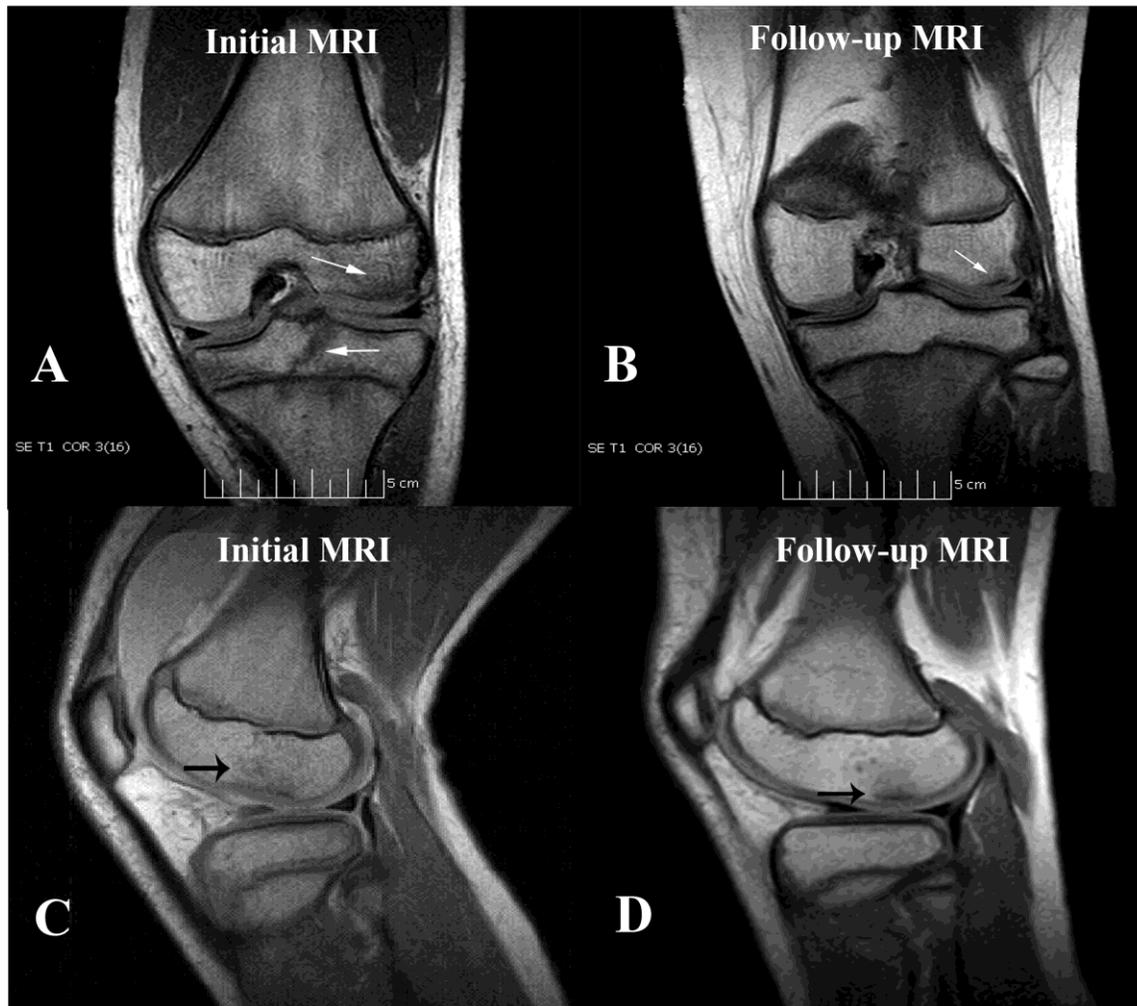


Figure 1. Case 1: A and C-Initial MRI showing lateral femoral condyle bone contusion (upper arrow) and tibial spine fracture (lower arrow); B and D-Follow-up MRI showing OCD lesion on lateral femoral condyle 2 years post tibial spine fracture.

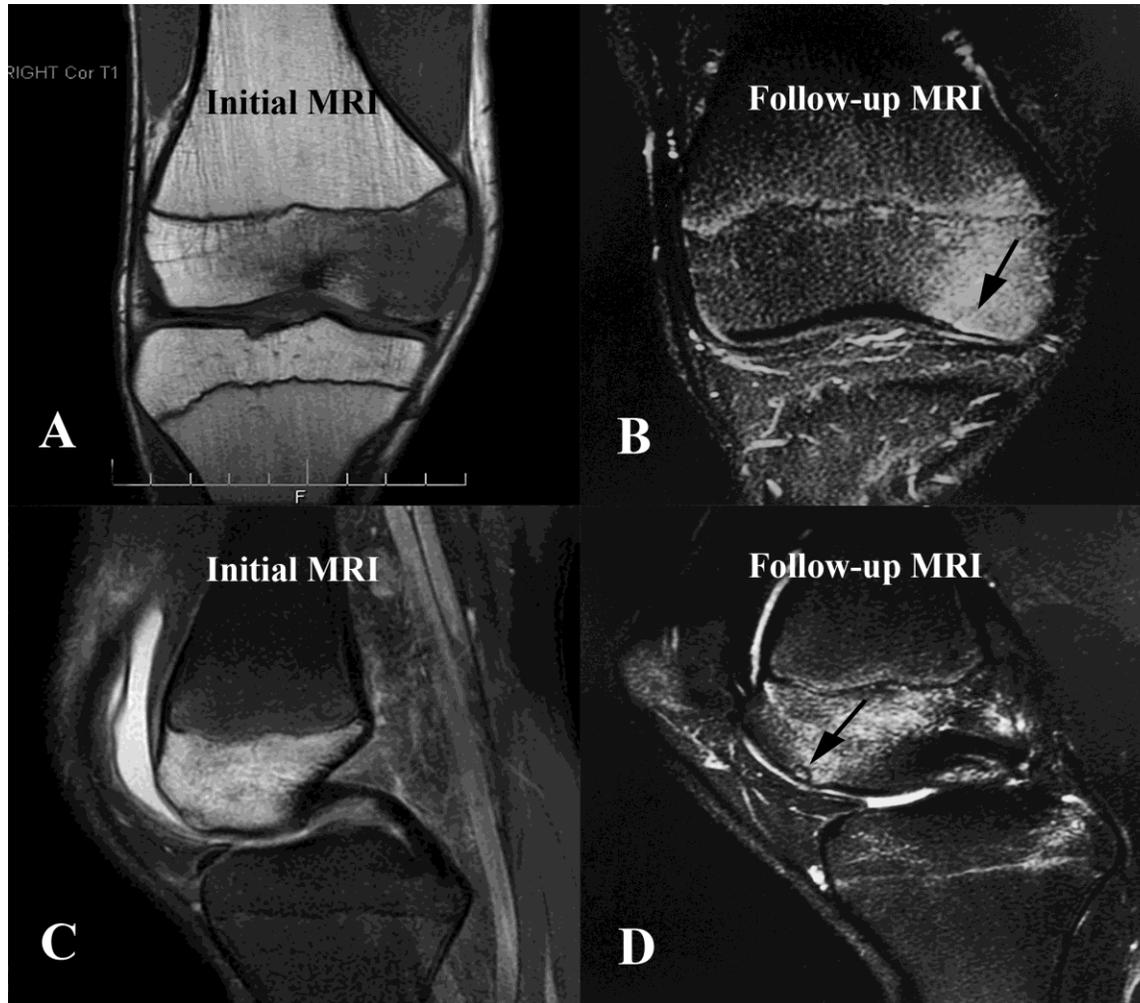


Figure 2. Case 2: A and C-Initial MRI showing medial femoral condyle bone contusion; B and D-Follow-up MRI showing OCD lesion (arrow) on medial femoral condyle 7 months post medial femoral condyle bone contusion.