Meniscal Root Entrapment of an Osteochondritis Dissecans Loose Body

Christopher R. Jones, MD, Joseph S. McMonagle, MD, and William E. Garrett Jr., MD, PhD

Abstract

Loose bodies are relatively common in the knee. On radiographs they can often be seen in the medial and lateral gutters, intercondylar notch, and the posterior compartment. At times an apparent loose body is not free to move in the knee because it has been covered by synovium and is no longer mobile. It is uncommon for an osteochondral loose body to become incorporated into meniscal tissue.

We report a case of an apparent loose body becoming incorporated into the posterior horn and root of the medial meniscus. We are not aware that this condition has been previously reported. Because removing the entire loose body would have destabilized the posterior root of the medial meniscus, it is important to be aware of this potential occurrence.

Tears of the posterior root of the medial meniscus have received considerable interest since the early 1990s.[1] Since that time, there have been considerable studies documenting the rapid development of degeneration of the knee articular cartilage after such an injury.[2] It is conceivable that iatrogenic destabilization of the posterior root of the medial meniscus would have a similar outcome.

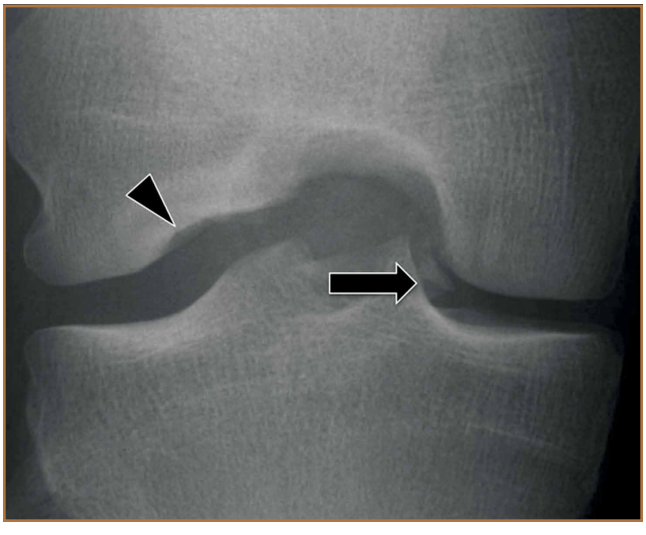
We report an interesting case of a patient with osteochondritis dissecans (OCD) who developed a symptomatic loose body within the posterior root of the medial meniscus. The patient provided written informed consent for print and electronic publication of this case report. This study was approved by the Duke University Medical Center Institutional Review Board.

Case Report

A 25-year-old man with previously diagnosed juvenile-onset OCD presented to our clinic with pain and recurrent swelling in his left knee after exercise. He had no mechanical symptoms, such as locking, popping, or catching. He had 10 years previously undergone an arthroscopic procedure for loose body removal and medial femoral condyle microfracture on the contralateral knee. Physical examination demonstrated full active range of motion (0° - 140°) of the left knee. There was no demonstrable anteroposterior, varus/valgus, or posterolateral knee instability. The patient had no joint line tenderness or pain on provocative meniscal testing, including McMurray test. The patient underwent preoperative left knee plain-film radiographs and magnetic resonance imaging (MRI) evaluation, which identified an osteochondral lesion of the lateral femoral condyle as well as an intra-articular well-corticated osseous body (**Figures 1, 2**).

Arthroscopic examination confirmed a well-healed defect involving the lateral femoral condyle that was without fissuring and was not ballotable. In addition, there was an osteochondral fragment that was easily moved but not completely free of the posterior horn of the medial meniscus. Using a 4-mm shaver, we debrided the loose body from superior to inferior and from anterior to posterior. The fragment projected well above the meniscal root and we did not initially discern an attachment (**Figure 3A**). As we debrided about 75% of the fragment, it was apparent that the remainder of the bone fragment was

Figure 1. Preoperative left knee posteroanterior radiograph. There is sclerosis and concave irregularity throughout the medial aspect of the lateral femoral condyle articular surface (arrowhead), suggestive of an osteochondral lesion. A curvilinear osseous body projects over the medial femorotibial compartment adjacent to the medial tibial spine (arrow).



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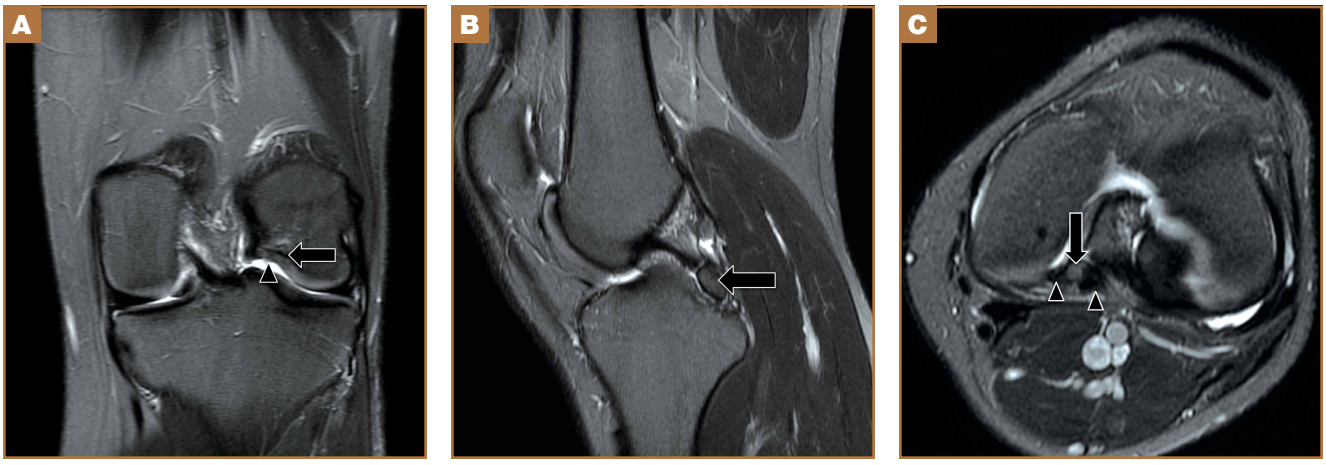

Figure 2. Preoperative left knee magnetic resonance imaging. (A) T1-weighted coronal sequence demonstrating a large (2.2 cm anteroposterior × 1.6 cm transverse) concavity of the inner margin of the posterior weight-bearing portion of the lateral femoral condyle (arrowhead) with prominent subchondral sclerosis. It is marginated superiorly by a thin hypointense line with intervening fatty marrow. Posteriorly, there is a 10-mm area of subchondral curvilinear edema (arrow) with overlying marked chondral signal inhomogeneity and an oblique full-thickness fissure. T2-weighted (B) sagittal and (C) axial sequences show an irregularly shaped 1.0 × 0.7-cm well-corticated osseous body (arrow) partially within the posterior root attachment of the medial meniscus (arrowheads).

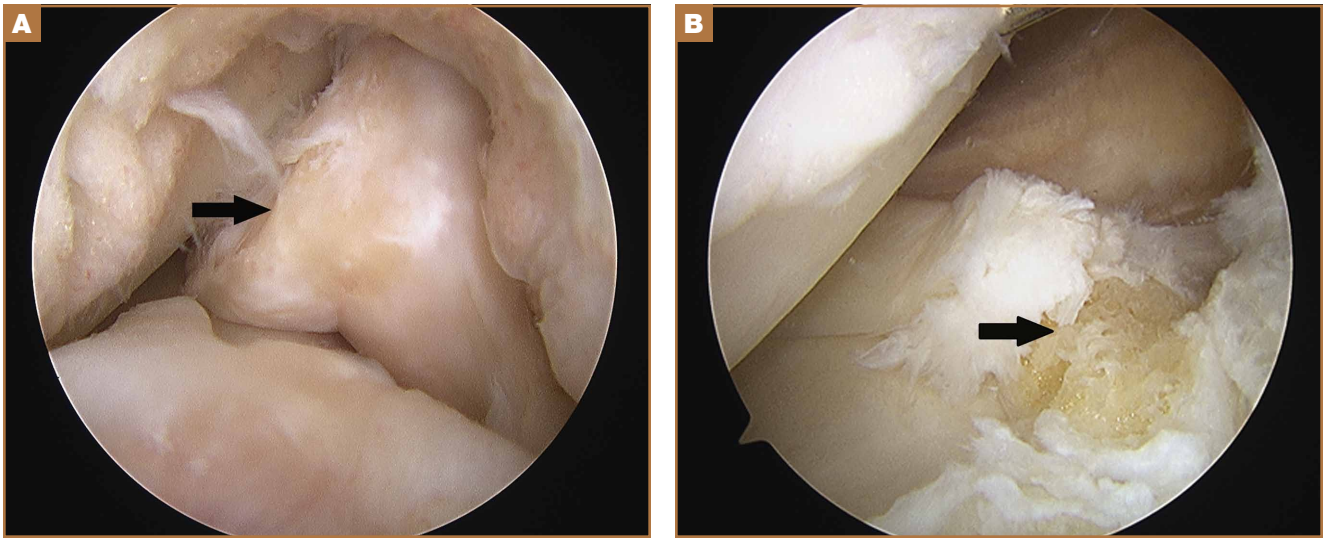

Figure 3. Intraoperative arthroscopic still images of the intercondylar notch of the left knee. (A) Mass projecting within the intercondylar notch with overlying synovial tissue (arrow). Mass obscures the posterior root/horn of the medial meniscus. (B) Mass has been debrided both in an anterior-posterior and superior-inferior fashion. The remaining ossified portion of the mass is seen adherent with the posterior root of the medial meniscus (arrow).

within the posterior horn and root of the medial meniscus (**Figure 3B**). The root of the meniscus included both meniscus and bone tissue, with most of it appearing as bone. Further removal would have destabilized the meniscal root.

At the conclusion of the case, the patient was placed in a bulky soft dressing. He was discharged on the same day from our ambulatory surgery center without any assistive devices. At latest follow-up, he demonstrated 0° to 130° active knee range of motion, was without mechanical symptoms, had resumed an active exercise program, and was pain-free.

Discussion

There have been many case reports describing the various locations of OCD loose bodies within the knee joint.[3,4] To our knowledge, there has not been a documented case of an OCD loose body that has become intimately associated with the posterior root of the medial meniscus. The distinct biomechanical stability afforded to the knee by the posterior root of the medial meniscus makes the presentation and management of our case quite interesting.

The majority of loose bodies within the knee tend to settle

within the posterior compartment of the knee.[5] We hypothesize that, in our case, the loose body broke free from our patient's established lateral femoral condyle OCD lesion. The large size of the fragment lead to its entrapment within the posterior intercondylar aspect of the knee. Ultimately, the osteochondral loose body scarred into a nearby soft-tissue site, the root of the medial meniscus. The patient subsequently developed recurrent swelling and pain secondary to the location of the lesion, which lead to the eventual MRI and arthroscopic examination.

Another disease process that can present with similar pathology is the meniscal ossicle. This avulsion injury of the medial meniscal insertion site (root) with a small bony fragment was first described in 1935 and is thought to be traumatic in nature.[6,7] Meniscal ossicles are generally 5 to 7 mm in size with rare case reports of ossicles that reach 10 mm in size.[8] Our patient's OCD fragment originated from a 2.2 × 1.6-cm lateral femoral condyle lesion and was 10 × 7 mm in size at the time of MRI evaluation.

From a multitude of biomechanical studies, we understand the primary function of the medial meniscus to include load transmission, shock absorption, and knee joint stability.[1] It has been found that 40% to 70% of the total weight borne by the medial compartment is absorbed by a functional meniscus.[9] When the posterior root attachment site is damaged, the biomechanical consequences are equivalent to a functional meniscectomy.[2] The increased awareness of the importance of an intact medial meniscal posterior root has lead to the development of 2 broad classes of repair options: transosseous and suture anchor. One such transosseous technique involves use of a posterior knee portal and transtibial tunnel.[10]

Three-Tesla MRI has improved evaluation of the medial meniscus and detection of early, associated cartilage changes. As a result, MRI findings, such as degenerative intrasubstance meniscal signal, are now better correlated to disruption of circumferentially oriented collagen fibers and associated decreases in resistance to hoop strain. Arthroscopic follow-up demonstrated that extrusion of the medial meniscus greater than 3 mm beyond the tibial margin on MRI examination frequently correlates with meniscal root tears.[10] Since the medial meniscus is better visualized and MRI associations are better understood, radiologists have begun to recognize and comment more on suspected pathology within the posterior root of the medial meniscus. The posterior root of the medial meniscal root is best seen as a band of low-signal fibrocartilage anchoring the posterior horn of the medial meniscus found in 2 contiguous coronal MRIs.[11]

Our patient had an intact medial meniscal posterior root at the time of arthroscopy. However, in order to address his pathology, debridement was required of the OCD fragment and associated medial meniscal root. We paid extra care to not fully debride the meniscal root and were particularly careful to probe the meniscus multiple times to ensure stability. In this case, it was felt that the large fragment caused the patient's pain, and removal was indicated. Complete removal may well have destabilized the meniscus. At final follow-up, patient was without radiographic signs of osteoarthritis or mechanical symptoms. The remaining bone fragment was clearly the majority of the root. Recognizing this attachment certainly altered our treatment.[6]

Conclusion

Generally, loose bodies are treated with complete excision, but the treatment must be modified when the loose body is integrated into the root of the meniscus. Surgeons who encounter such a lesion should proceed with caution when debriding the root of either meniscus. Frequent meniscal probing and careful debridement, with particular attention paid to removing the majority of the osseous lesion while maintaining meniscal root attachment and stability, are paramount.

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This paper will be judged for the Resident Writer's Award.