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Osteochondritis Dissecans of the Patella

MRI Evaluation and a Case Report

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Osteochondritis dissecans of the patella is a rare cause of anterior knee pain. An illustrative case in a 22-year-old man demonstrates the current imaging modalities and surgical treatment. Specifically, magnetic resonance imaging (MRI) and arthroscopic knee surgery are discussed along with a review of the literature. Unlike standard roentgenograms, MRI can be helpful in determining the viability of the osteochondritic fragment and the amount of remaining attachment to the surrounding cancellous bone. This finding can have important bearing on choice of treatment. When surgery is indicated, arthroscopic treatment with excision of the fragment and curettage offers distinct advantages over open arthrotomy. Lateral release or other realignment procedures may be done in combination with the primary procedure. Prognosis for full recovery of knee function and relief of patellar pain is guarded in patients who require surgery.

Osteochondritis dissecans (OCD) is defined as a partial or total separation of a segment of articular cartilage with its underlying subchondral bone. This lesion is rare in the patella.[6,7,11,12,15–19,22] The etiology of OCD of the patella and other areas is not known. Most authors accept the theory that the initial event in the pathogenesis of an OCD lesion represents a combination of ischemic necrosis and trauma.[2,3,6,7,19]

Radiologic evaluation of symptomatic knee(s) may demonstrate the osteochondritic lesion. Magnetic resonance imaging (MRI) can be useful for further evaluating OCD of the patella or in identifying it as the cause of anterior knee pain when standard roentgenograms fail to show pathology. Little has been written regarding the MRI appearance of OCD. This lesion does, however, pathologically reflect ischemic necrosis of bone (INB). It therefore follows that the MRI changes of these two entities should be similar.[1,13,14] MRI provides an assessment of OCD fragment vascularity and amount of detachment from its underlying bone.[10,20] This has important implications for prognosis and treatment.

Most authors agree that operative treatment for OCD of the patella is indicated for (1) symptomatic lesions, (2) intraarticular loose bodies, (3) lesions demonstrating subchondral sclerosis, and (4) complete or partial separation of the osteochondritic fragment.[6,7,19,21,22] Arthroscopic treatment of OCD of the patella has only recently been reported.[6,19] When properly performed, arthroscopic knee surgery can adequately treat the OCD lesion and address associated problems such as patellar tracking.

The following case report exemplifies many of the common findings seen in OCD of the patella that have been previously covered in the literature. Special attention has been given to the MRI evaluation and arthroscopic surgical findings and treatment.

CASE REPORT

A twenty-year-old boxer slipped on wet pavement and twisted his left knee. Initial evaluation

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and treatment was rendered by an emergency department. The patient wore a knee immobilizer intermittently for two weeks and then attempted to return to normal activities that included conditioning training and weight lifting. Five weeks after his left knee injury he was still experiencing pain with stair climbing and leg curls. At this point he sought orthopedic consultation. He complained of past pain located in the popliteal fossa and anterior knee. He denied sustaining a direct blow to the knee, the sensation of a "pop" or dislocation of his patella. His past history was notable for mild peripatellar pain with activity, but he denied any episodes of the knee giving way, locking, or swelling.

Examination revealed a muscular, well-developed man. His left knee was without evidence of external trauma or surgical scars. He had a slight effusion, a full range of motion, stable knee to varus/valgus testing, and a negative Lachman. Medial patellar tenderness was noted as well as crepitation with passive range of motion. Active range of motion demonstrated lateral tracking of the patella. His quadriceps angle was 12° bilaterally. Thigh girths were measured as 61 cm on the right side, and 59 cm on the symptomatic left side. Provocative testing such as patellar apprehension, McMurray's, Apley's, and pivot shift were negative.

Standard roentgenograms were obtained. The lateral and skyline views of the patella revealed an osteochondral fragment and subchondral sclerosis in the lower half of the patella articular surface (Fig. 1). MRI was performed on a 0.3-tesla (T) system, using spin echo techniques. Axial and sagittal T1- and T2-weighted images were acquired. T1-weighted images revealed a well-circumscribed subchondral region of low signal intensity (black) in the inferomedial patella. The overlying articular cartilage was indistinct (Fig. 2). With T2-weighted imaging, the lesion retained low signal intensity, and high signal intensity (white) fluid could be seen surrounding the fragment (Fig. 3).

Arthroscopy of the left knee was performed

FIG. 1. Lateral view of the left knee. The osteochondritic fragment is located in the inferior half of the patella.

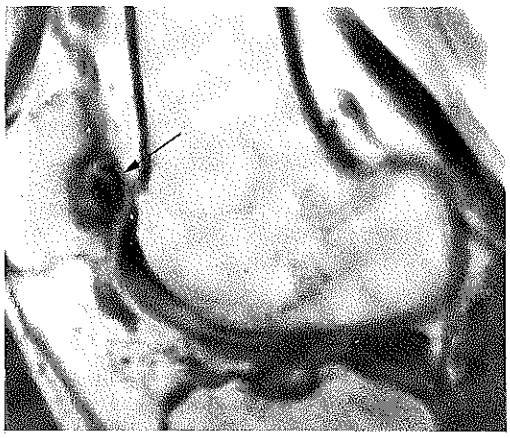

FIG. 2. Sagittal T1-weighted MR image (spin echo 500/30). The bony portion of the osteochondral fragment is low signal intensity (arrow), and the overlying articular cartilage is ill defined. Normal adjacent marrow is high signal intensity.

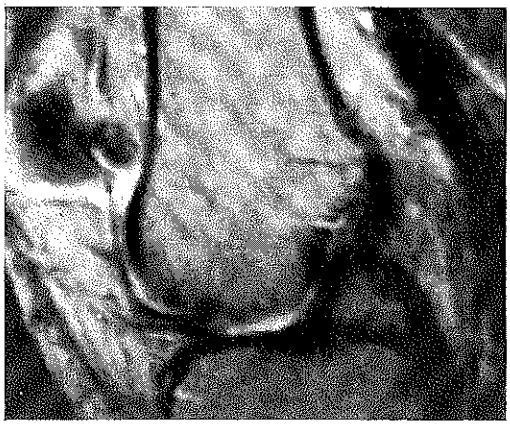

FIG. 3. Sagittal T2-weighted MR image (spin echo 2000/85). High signal intensity fluid surrounds the fragment.

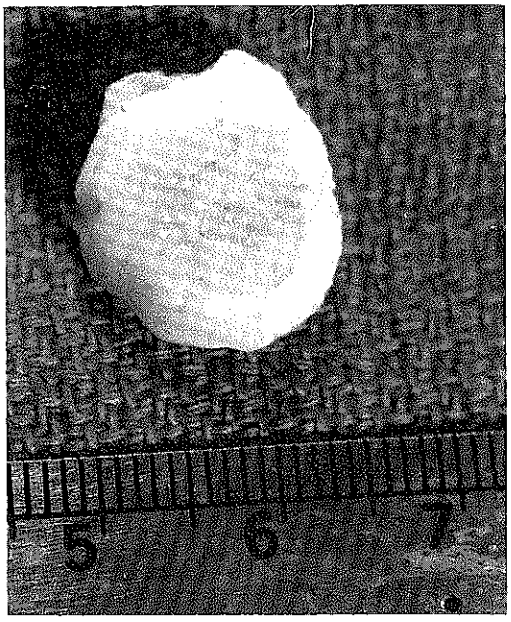

FIG. 4. Gross specimen excised measuring 1 cm by 1 cm.

through superomedial, inferomedial, and inferolateral portals. A 1-cm by 1-cm osteochondral fragment still partially attached to the patella was found (Fig. 4). The osteochondritic lesion was in the inferior third of the patella over the patellar ridge. Patellar tracking viewed from the superomedial portal seemed to be lateral. No additional knee pathology was seen. Treatment of the patellar lesion consisted of removal of the impending loose body and curettage of the bed to bleeding bone. An arthroscopic subcutaneous lateral release was then performed.

Postoperative rehabilitation was instituted immediately after surgery. This consisted of weight bearing as tolerated and physical therapy for knee exercises, range of motion, and muscle strengthening. The patient went back to full activity, including resumption of his training program for boxing. After one year, he is pain free and has no functional limitations.

DISCUSSION

Although relatively rare, OCD of the patella must be considered in the differential diagnosis of patellar pain. The clinical incidence of OCD of the patella is not known. However Schwarz *et al.*[19] derived from a surgical knee registry of more than 30,000 operations an operative incidence of 0.15%.

Recent reports and this case indicate that the lower half of the patella over the patellar ridge is the most frequent location for the osteochondritic lesion. Most studies agree that the superior portion of the patella is spared.[6,7,19] This finding is difficult to explain based on the current theory that includes ischemic necrosis in the development of OCD of the patella. The lower portion of the patella has a dual circulation from the midpatellar vessels and polar vessels that enter the inferior pole.[18] If the pathology of OCD were related to defects in blood supply alone, the superior portion of the patella should be affected at a greater rate. The increased incidence of lesions in the lower and middle thirds of the patellar articular surface is consistent with studies on contact areas and forces during knee flexion.[6,8] From these studies, it appears that repeated minor trauma to the articular surface is a more important contributing factor to the development of patellar OCD than ischemic necrosis. Minor trauma to the knee can be in the form of direct injury or tangential shearing forces on the patella secondary to subluxation or dislocation. A history of trauma has been cited in roughly one third of the cases reported.[19] Patellofemoral maltracking and excessive lateral pressure syndrome may also be additive agents in the pathogenesis of OCD lesions. Most likely, OCD of the patella has a multifactorial etiology and there are other factors not yet appreciated that interplay with trauma and ischemic necrosis in its development.

MRI is a relatively new modality for the evaluation of musculoskeletal pathology. Its usefulness in the knee has already been proven as an adjunct in diagnosing meniscal pathology, avascular necrosis, or in evaluating the cruciate ligaments.[20] New uses continue to be uncovered. In the previous reported cases of OCD of the patella, MRI was not used as an imaging modality.

Ischemic necrosis of bone (INB) has been

extensively studied with MRI.[1,4,13,14] INB is a dynamic process and the MRI appearance reflects a continuim from normal marrow, attempts at repair, to necrosis.[1,13] Normal adult fatty marrow is high signal intensity (white) in spin echo T1- weighted images. Depending primarily on the field strength of the magnet used for image acquisition, normal marrow fat will show intermediate signal intensity (high field) to high signal intensity (low field) with T2-weighted imaging. Necrotic bone (saponified fat or amorphous cellular debris or both) is low signal intensity with both pulse sequences. In areas of attempted repair, fibrovascular tissue shows low to intermediate signal intensity in T1-weighted images, and high signal intensity with T2-weighting. Marrow edema appears similar to this, probably because of the increased water content.[4,14]

In this case, radiographic studies were important for preoperative planning. Standard roentgenograms revealed sclerotic margins suggesting a chronic lesion with poor potential for healing. Using MRI, the nonviability of the OCD fragment was assessed preoperatively with T2-weighted images clearly demonstrating a fluid layer between the OCD fragment and its cancellous bed. On the basis of these studies, no attempt was made to reattach the fragment. In lesions where no interposed fluid is detected, observation or internal fixation of the fragment may be considered.

Most authors agree that removal of an osteochondritic fragment is indicated once it is separated from its underlying bone.[6,7,19,21] The high shear and contact pressures of the patellofemoral articulation probably preclude reattachment of the fragment to its subchondral base.[6,21] No conclusions can yet be made whether results are superior with curettage and drilling over curettage alone. Both are likely to open channels for vascular ingrowth that allow healing and reconstitution of the articular surface by fibrocartilage.[5]

Few reports in the literature have included cases of OCD of the patella treated arthroscopically.[6,19] Arthroscopic treatment for OCD lesions of the distal femur and talar dome continues to gain acceptance.[9] As more surgeons acquire arthroscopic skill and equipment improves, this may become the preferred treatment approach for patellar lesions as well. Advantages of arthroscopy over arthrotomy for treatment of appropriate intraarticular pathology include lower morbidity, accelerated rehabilitation, and fewer complications.[9,11]

Another advantage of arthroscopy is in evaluating patellar tracking. Lateral release seems indicated either alone or in conjunction with other realignment procedures if lateral subluxation is observed during arthroscopy. A lateral release was done during the primary procedure in 15% of the knees in the study done by Schwarz *et al.*[19] Lateral tracking of the patella was noted in this patient on both physical examination and during arthroscopy. A subcutaneous lateral release was performed in an effort to minimize tangential shearing and contact forces. Even without arthroscopic or historical evidence of patellar subluxation, a lateral release may favorably alter the contact pressures of the patellofemoral articulation and contribute to relieving knee pain.[8]

Schwarz *et al.*[19] believed that, generally, patients who come to surgery for OCD of the patella have a guarded prognosis. Residual patellofemoral pain was found in 71% of their patients and 62% complained of some functional limitations. Bilateral lesions, central equatorial location, and large size have been factors identified as predictive of a poor result.[6,19] History of trauma and presence or absence of a loose body have not affected long-term results. Earlier published reports were more optimistic regarding prognosis; however, follow-up evaluation was usually not comprehensive, and residual patellofemoral pain could be present and still be considered a good result.[7,15,21]

OCD of the patella is rare, usually affecting young males. Patellar pain, effusion, and patellofemoral crepitus are the common symptoms. MRI assessment of the OCD fragment

viability and attachment to underlying cancellous bone may have implications for prognosis and guide treatment. Despite a guarded prognosis, arthroscopic treatment of symptomatic lesions with removal of fragment and curettage is recommended.

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