

Arthroscopic Preparation and Internal Fixation of an Unstable Osteochondritis Dissecans Lesion of the Knee

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Abstract: We present our arthroscopic technique for fixation of an unstable osteochondritis dissecans (OCD) lesion. This technique includes arthroscopic evaluation of cartilage and bone quality of the OCD fragment, hinging open the lesion, debridement of fibrous nonunion tissue, reducing the fragment, and obtaining multi-point compression screw fixation. This technique avoids the morbidity of an open arthrotomy and should be considered when treating an unstable OCD lesion with adequate bone for fixation.

Osteochondritis dissecans (OCD) is characterized by subchondral bone avascular necrosis and subsequent deterioration of the overlying articular cartilage.^{1,2} This can lead to pain, effusion, mechanical symptoms, and early joint degeneration. With an annual incidence of 15 to 29 per 100,000 population, OCD lesions are a significant source of knee pain in high-demand skeletally immature and mature athletes.^{3,4} Although the exact etiology is unclear, the multiple contributing factors include ischemia, repetitive trauma, failure of growth-center ossification, inflammatory processes, and genetic predisposition.⁵⁻⁹ In the skeletally immature patient, comprehensive nonoperative treatment with activity modification, physical therapy, and oral analgesics may be a viable option. Stable, juvenile OCD lesions have improved spontaneous healing rates compared with adult OCD lesions.¹⁰ However, surgical intervention is required for refractory juvenile OCD lesions and all symptomatic adult OCD lesions.¹¹

Surgical options include drilling, in situ fixation, open reduction–internal fixation, and more advanced restorative procedures such as marrow stimulation,

osteochondral autograft transfer, osteochondral allograft transplantation, and combined bone grafting with autologous chondrocyte implantation. Depending on the degree of complexity of the surgery, these procedures may be performed through open or arthroscopic techniques. When feasible, arthroscopy is desirable over open techniques because of decreased operative morbidity and quicker recovery. We describe an arthroscopic technique used to treat an unstable OCD lesion of the femoral condyles. During this arthroscopic procedure, the unstable fragment is hinged open, the bony bed is prepared by removing fibrous tissue, and the lesion is fixed with Bio-Compression screws (Arthrex, Naples, FL).

Technique

In our experience, the described technique works well for stable OCD lesions with intact cartilage after failed nonoperative management or for unstable OCD lesions that have adequate bone for internal fixation. The preoperative radiographs and magnetic resonance imaging are valuable to assess the bone quality and thickness of the OCD fragment and to identify any loose bodies (Figs 1 and 2).¹² In our experience, 3 to 4 mm of non-fragmented bone is required to achieve stable internal fixation. Each potential surgical option should be discussed with the patient before embarking on the diagnostic arthroscopy. If a large bone fragment is identified and deemed amenable to fixation (the preferred technique), osteochondral preservation with internal fixation is performed. If the OCD lesion has insufficient bone stock or fragmentation, arthroscopic removal is performed. If the secondary osteochondral lesion size is small, we proceed with osteochondral autograft transfer. If the osteochondral defect is too large,

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Fig 1. Initial presenting right knee radiographs showing an OCD lesion of the lateral femoral condyle on (A) posteroanterior (PA) flexion and (B) lateral views.



Fig 2. Initial (A) sagittal and (B) coronal T2-weighted magnetic resonance images obtained before initiation of nonoperative treatment, showing the OCD lesion of the lateral femoral condyle of the right knee. One should note the increased linear signal at the base of the lesion present on both views. (C) Sagittal and (D) coronal T2-weighted magnetic resonance images of the knee obtained after 5 months of nonoperative treatment showing minimal improvement or interval healing. We find magnetic resonance imaging very helpful in measuring the amount of bone present on the OCD lesion and also if there is any fragmentation present.

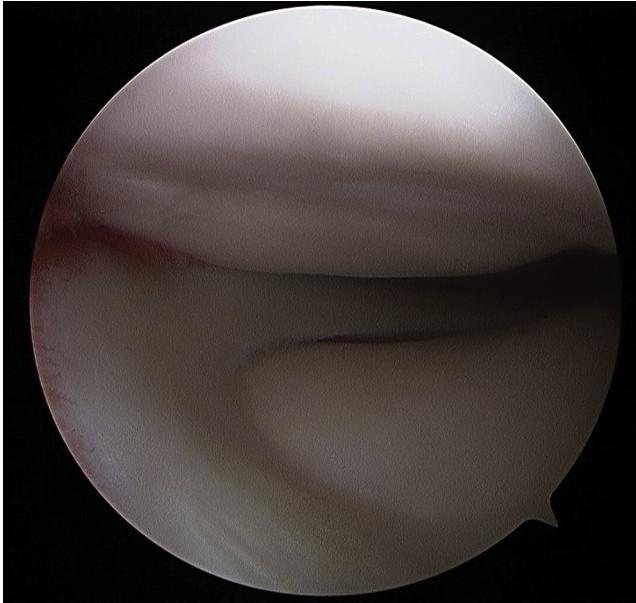


Fig 3. Arthroscopic view of OCD lesion of lateral femoral condyle from inferomedial viewing portal.

a size-matched fresh osteochondral allograft transplant is planned as a future staged procedure.

The knee is examined under general anesthesia and then prepared and draped in the standard fashion. A tourniquet is placed high on the thigh but is not inflated during the arthroscopic portion of the procedure. The surgical technique is detailed in [Video 1](#). A thorough diagnostic arthroscopy is performed, including assessment of the suprapatellar pouch, medial and lateral gutters, and posteromedial and posterolateral compartments for any possible loose bodies. In addition, the

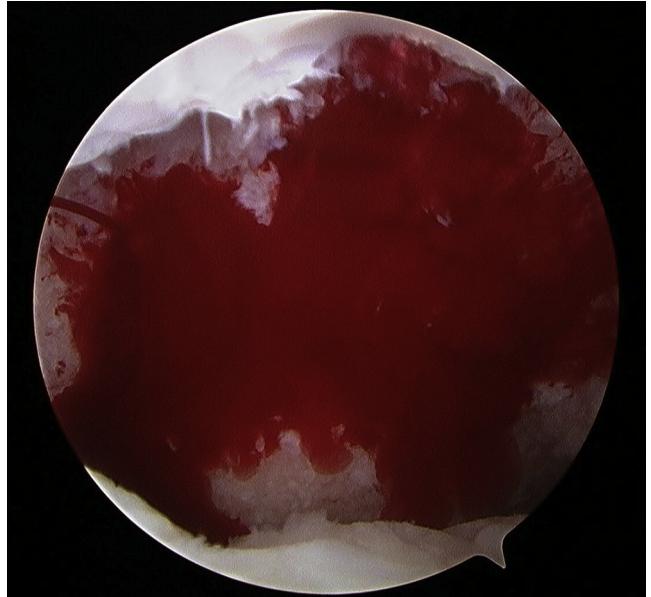


Fig 5. Arthroscopic view (from inferomedial viewing portal) of base after removal of fibrous nonunion tissue. The bleeding bone confirming vascularity should be noted.

other articular cartilage surfaces, menisci, and ligaments are examined.

In this particular case, examination of the lateral femoral condyle from an inferomedial viewing portal showed a large OCD fragment involving the middle and posterior thirds of the condyle ([Fig 3](#)). The articular surface of the lesion was largely intact with the exception of a fissure along the anterior margin. We find it important to carefully inspect the entire periphery of the OCD fragment because a cleft or fissure is often found. In this case the fragment was ballotable with a blunt probe

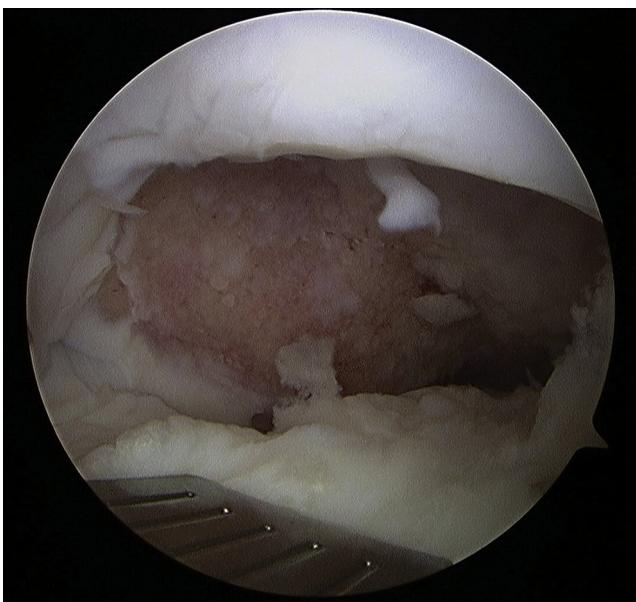


Fig 4. Arthroscopic view (from inferomedial viewing portal) of subchondral bone after lesion has been hinged open.



Fig 6. Final view (from inferomedial viewing portal) of OCD lesion showing multi-point screw fixation.

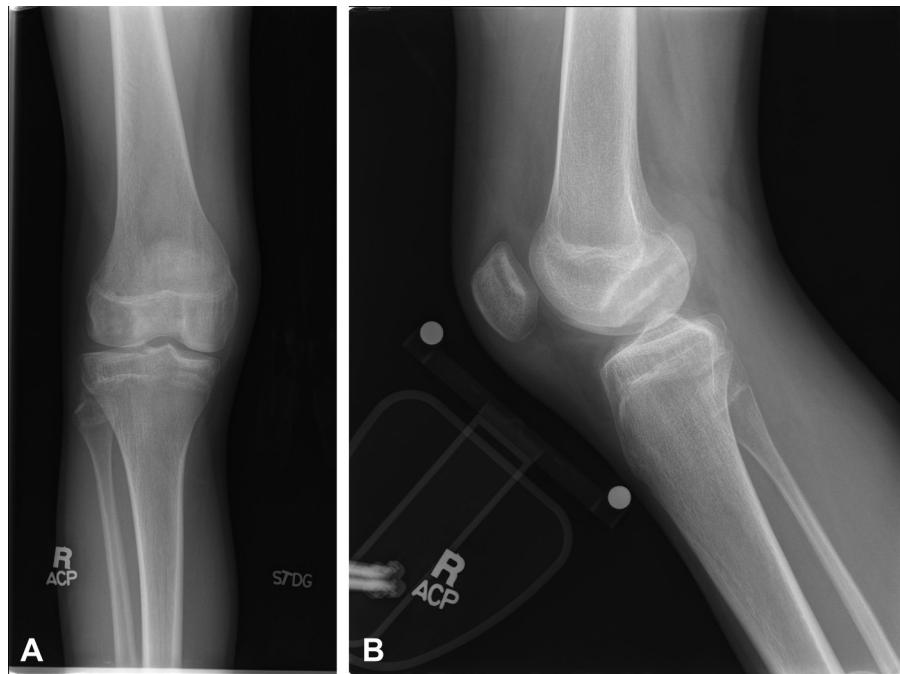


Fig 7. Radiographs of knee obtained 12 weeks postoperatively showing satisfactory restoration of articular surfaces: (A) anteroposterior view and (B) lateral view.

inserted through the inferolateral portal. At that time, the fragment was deemed unstable and the decision was made to hinge open the fragment to prepare the base for fixation. A knife was used to open the lesion at its anterior fissure. The posterior attachment was left intact, which allowed the fragment to be hinged open to access the base of the lesion (Fig 4).

Once the base was fully exposed, attention was directed to preparing the bed for fixation. The subchondral bone was covered with a layer of fibrous tissue that is typical in unstable OCD lesions. This tissue was removed with a curette and a motorized shaver. After all the fibrous tissue was removed, the inflow was turned off to confirm adequate bony bleeding from the entire bed (Fig 5). After subchondral bone preparation,

attention was turned to removing fibrous tissue from the undersurface of the osteochondral fragment by lightly scraping the surface with a curette. The fragment was then reduced to the bony base, and anatomic reduction was confirmed by flexing and extending the knee to visualize the entire lesion.

The OCD fragment was then provisionally fixed with a single K-wire through the inferolateral portal. After this, an accessory trans-patellar tendon portal was created to allow perpendicular access to the fragment. The lesion was fixed in place by use of a total of 4 Bio-Compression screws. Each fixation site was drilled, measured, and tapped before placement of the screws. Each compressive screw was countersunk 2 to 3 mm deep to the articular cartilage surface, with great care

Table 1. Technical Pearls for Treating OCD Lesions of Knee

Steps	Pearls
Assess bone with MRI	<ul style="list-style-type: none"> • Ensure 3 to 4 mm of adequate bone to allow adequate compressive fixation • Assess possible fragmentation of lesion • Identify loose bodies
Discuss all intraoperative possibilities with patients preoperatively	<ul style="list-style-type: none"> • Fix stable or reducible lesions of adequate quality (preferred method of treatment) • If fragment is ≤ 2 to 3 cm^2 and cannot be fixed, excise and transfer OAT plug(s) • If fragment is ≥ 2 to 3 cm^2 and cannot be fixed, excise and plan for staged OCA • Lateral femoral condyle lesions can be hinged on posterior cartilage • Medial femoral condyle lesions can be hinged on PCL soft-tissue attachment • Thoroughly debride all fibrous tissue
Open lesion as hinge	<ul style="list-style-type: none"> • Ensure adequate base preparation by turning off inflow and observing bone bleeding • Create accessory portals as needed to obtain perpendicular fixation • Use K-wires for stabilization during fixation • Use multi-point screw fixation • Recess screws below articular surface but not through the fragment compromising fixation
Prepare lesional base	
Ensure secure anatomic fixation	

MRI, magnetic resonance imaging; OAT, osteochondral autograft transfer; OCA, osteochondral allograft transplant; PCL, posterior cruciate ligament.

taken not to over-advance the screw and lose fixation of the fragment. The K-wire was then removed, and the lesion was tested for stability with a blunt probe (Fig 6).

Postoperative Rehabilitation

After surgery, patients are restricted to toe-touch weight bearing for the first 6 weeks. Emphasis is placed on edema reduction to encourage early pain control and quadriceps activation. Continuous passive motion is instituted on the first postoperative day at 0° to 30° of range of motion, with instructions to advance to 0° to 120° as able. After 6 weeks, new radiographs are obtained; the continuous passive motion is discontinued; and the patient is allowed to begin partial weight bearing, advancing to full weight bearing as tolerated without crutches by 12 weeks. Strength training in the first 6 weeks focuses on straight-leg raises and quadriceps sets for quadriceps strengthening. This is advanced as tolerated after the initial 6-week postoperative period, and new radiographs are obtained at the 12-week postoperative mark (Fig 7).

Discussion

Knee pain due to OCD is a common reason that patients present to orthopaedic surgeons.^{3,4} In young, skeletally immature patients, these lesions can often be successfully treated with a comprehensive nonoperative regimen of restricted weight bearing and activity modification to offload the affected area until healing occurs.¹⁰ However, patients with persistent symptoms despite these modalities typically require surgical intervention.¹³ A number of surgical options, ranging from simple *in situ* arthroscopic fixation to open articular cartilage restoration and limb realignment procedures, have shown efficacy in appropriately selected patients.¹⁴

If possible, it is desirable that these lesions be fixed in a manner that maximizes healing potential while minimizing recovery time and time out of sport for young athletes. Many cartilage restoration techniques are available today, but healing of the native bone and cartilage is certainly the most desirable. In skeletally immature patients, Kocher et al.⁶ found an osseous integration rate of 84.6%. With regard to choice of fixation, bioabsorbable screws have the advantage of not necessitating removal and do not negatively affect subsequent magnetic resonance imaging studies. However, metal headless compression screws can also be used. In our experience, we have found that metal screws with a longer guidewire can be successfully used and later removed arthroscopically as well.

This technical note describes an arthroscopic technique for treating OCD lesions of the knee that includes assessment of stability, hinged opening or partial detachment of the lesion, preparation of the subchondral bone

base, fragment reduction, and multi-point fixation. It has the benefits of being able to treat unstable OCD lesions in an arthroscopic manner that avoids the morbidity of an open arthrotomy. Diligent preparation of the base, which is confirmed by visualization of bony bleeding, improves the healing potential of these lesions. Although this technique may not be technically feasible for all lesions of the knee, it can effectively treat most lesions of the medial and lateral femoral condyles through standard arthroscopy portals with selective additional accessory portals as needed. Risks of the procedure potentially include persistent pain and fragment instability due to inadequate base preparation, nonanatomic reduction, or fixation failure. These risks can be minimized when proper surgical techniques are used (Table 1).

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