Technical Note

All-Arthroscopic Bone Grafting and Primary Fixation of a Medial Femoral Condyle Osteochondritis Dissecans Lesion

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Abstract: Treatment of osteochondritis dissecans (OCD) lesions poses a significant challenge for orthopaedic surgeons and can cause debilitating limitations on the activity of patients. Timing of intervention, surgical technique, and selection of graft when needed are all key elements of treatment that need to be considered carefully and discussed with patients. Primary fixation of an OCD fragment with intact subchondral bone has been shown to be beneficial in some cases. There is limited literature, however, on how to approach large chondral lesions in young patients without a large subchondral base attached to the fragment. Treatment of large OCD lesions of the knee with an all-arthroscopic approach provides several benefits, including limited dissection for exposure, improved ability to assess the stability of the OCD lesion during articulation after fixation, and an expedited recovery compared to an open approach. The purpose of this technical note is to detail a technique of performing an all-arthroscopic bone grafting and primary fixation of a medial femoral condyle OCD lesion.

Osteochondritis dissecans (OCD) is an osteonecrosis lesion of subchondral bone that leads to the separation of a bone-cartilage fragment that may become displaced in the joint space.[1] OCD in children is a rare cause of joint pain, affecting between 15 to 29 people per 100,000, particularly in the knee.[2] Patients who develop OCD lesions are likely to be males between 12 to 19 years of age and are often involved in athletic activity.[2] Although the etiology of OCD lesions is unknown, it is proposed that repetitive microtrauma and hypovascularization of the perichondrium increase the risk of developing an OCD lesion. Additionally, genetic disposition is a risk factor that is observed in these patients.[3,4] OCD lesions of the knee comprise 75% of all OCD cases, with lesions of the medial femoral condyle making up approximately two thirds of all knee OCD lesions.[5-7]

Treatment options for OCD lesions of the knee vary based upon the age, location, and lesion characteristics. Patients with a stable, nondisplaced OCD lesion may receive conventional nonoperative treatments.[7] Nonoperative treatment consists of a 4- to 6-week period of immobilization followed by physical therapy, which has traditionally focused on improving strength, mobility, and flexibility of the injured joint.[7,8] In current practice, it is recommended that physical therapy focuses on strengthening quadriceps and core abdominal musculature.[2] The healing rate with nonoperative treatments, however, can be less than 50%.[2,9] Adolescents with an unstable or displaced OCD lesion, along with adults and those who have not responded to nonoperative therapy, often require surgical management.[2]

There are multiple surgical techniques described for OCD fixation. A thorough preoperative workup is essential to identify lesion stage, size, and stability.[2] The goal of operative treatment includes fixation of the unstable fragment, repair of the defect, and

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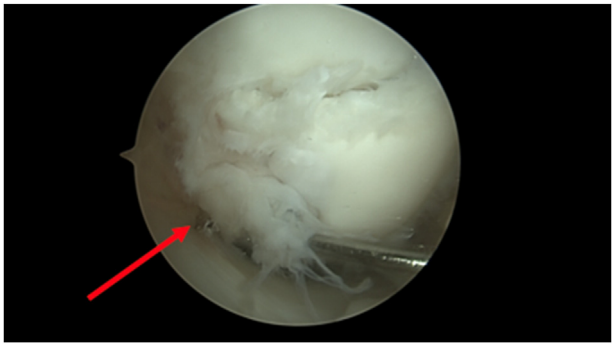

Fig 1. Arthroscopic image of a right knee viewing from the anterolateral portal demonstrating a medial femoral condyle OCD lesion (red arrow).

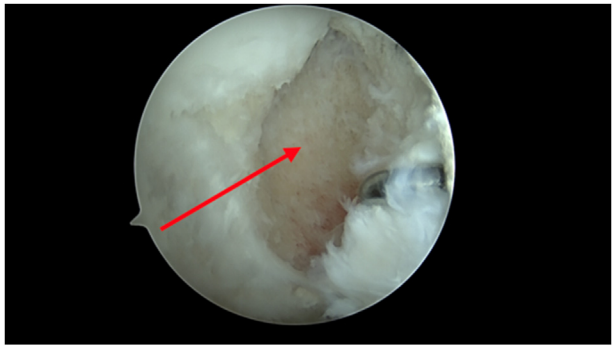

Fig 3. Arthroscopic image of a right knee viewing from the anterolateral portal demonstrating underlying medial femoral condyle bony bed (red arrow) after thorough debridement.

maintenance of joint congruence.[2] In this technical note, we describe a technique used for lesions with subchondral bone defects via an all arthroscopic technique with bone grafting and primary fixation of a medial femoral condyle OCD lesion.

Surgical Technique

Patient Setup and Diagnostic Arthroscopy

The patient is positioned supine on the operating table with a standard knee arthroscopy set up per preference of the surgeon. A tourniquet may be applied to the upper thigh. A standard anterolateral portal is created, followed by an anteromedial portal through needle localization. Diagnostic knee arthroscopy is then performed to evaluate for associated injuries and to determine the extent of the osteochondritis dissecans lesion.

Preparation of the OCD Lesion

The OCD lesion is visualized from both portals with special attention paid to the size, location, depth, the amount of subchondral bone attached to the fragment, and the amount of bone loss to the underlying femoral surface (Figs 1, 2). Based upon these characteristics the surgeon can decide if the OCD lesion is fixable, and if it should be done arthroscopic or open. When proceeding with all-arthroscopic repair, the OCD fragment and the underlying bony bed are debrided of any loose chondral flaps with the careful use of an oscillating shaver (Fig 3). To stimulate bleeding and to promote healing, a bur and a PowerPick device (Arthrex, Naples, FL) are used to create multiple small marrow stimulation holes in the subchondral bone (Fig 4).

Bone Grafting of the Underlying Bony Bed

When there is a bone void beneath an intact cartilage cap, bone grafting may be necessary to provide structural supports to the overlying cartilage. This can be performed with either autograft or allograft bone. A Yankauer suction device can then be cut in half and used to aid in bone grafting of the OCD lesion (Fig 5). The medial portal is enlarged, and the suction tip is placed straight in line with the lesion beneath the cartilage. The arthroscopic water flow is then turned off to allow for the placement of cancellous bone chips through the suction tip into the defect. A freer elevator or arthroscopic grasper can be used to stabilize and

Fig 2. Arthroscopic image of a right knee viewing from the anterolateral portal demonstrating an unstable medial femoral condyle OCD chondral fragment and underlying bony bed (red arrow).

Fig 4. Arthroscopic image of a right knee viewing from the anterolateral portal demonstrating bony bed after drilling to create multiple marrow stimulation/microfracture tunnels (red arrow).

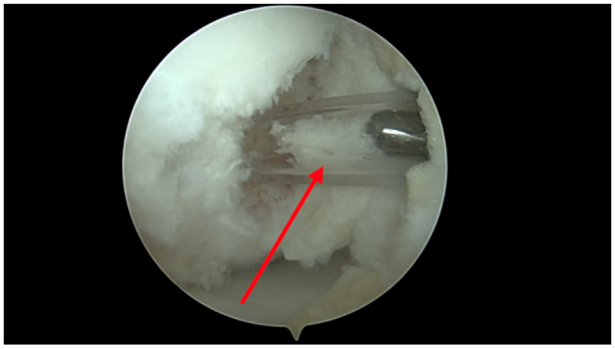

Fig 5. Arthroscopic image of a right knee viewing from the anterolateral portal demonstrating clear suction tip with cancellous bone graft (red arrow) being placed into the bony bed.

compress the bone graft to the proper level at the base of the defect.

Fixation of the OCD Fragment

The OCD fragment is then reduced into the proper position with a probe and two 2.0 mm Kirschner wires are placed through the OCD fragment, perpendicular to the articular cartilage surface and parallel to one another (Fig 6). The fragment is probed to ensure appropriate position and fixation. A clear, cannulated guide is then placed over the wire, and the fragment and underlying bone are drilled and tapped to the proper depth. The cannulated guide is maintained in position while the wire is removed, and a bioabsorbable headless compression screw (Arthrex) is then placed into the hole (Fig 7). The steps are then repeated to the inferior wire and fixation point. The fragment is probed to ensure appropriate fixation after the placement of each biocompression screw.

Final Intraoperative Examination

The knee is then taken through a final range of motion under arthroscopic visualization, confirming

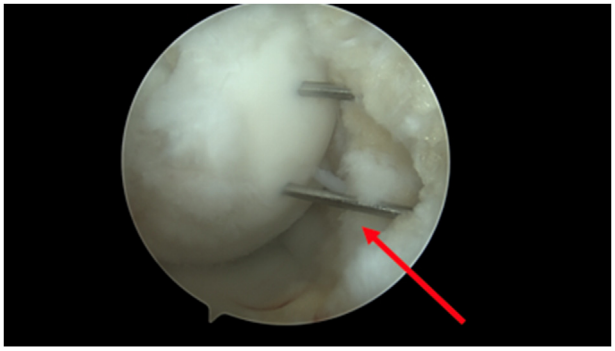

Fig 6. Arthroscopic image of a right knee viewing from the anterolateral portal demonstrating OCD lesion reduced and provisionally pinned with two 2.0 Kirschner wires (red arrow) through the anteromedial portal.

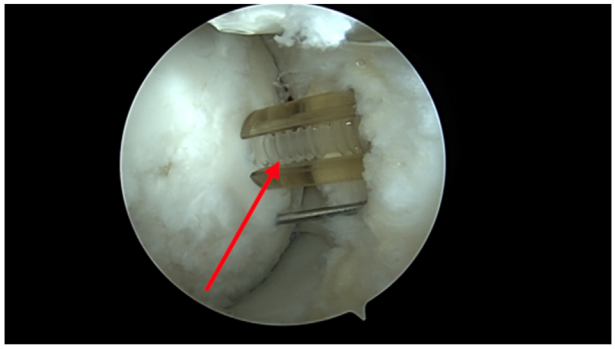

Fig 7. Arthroscopic image of a right knee viewing from the anterolateral portal demonstrating placement of superior bioabsorbable headless compression screw (red arrow).

appropriate positioning and stability of the OCD fragment (Fig 8). The joint is thoroughly irrigated to remove any loose fragments from the bone grafting, and the wounds are irrigated and closed in a standard, layered fashion. A soft dressing is placed, followed by a hinged knee brace locked in full extension. The above-mentioned technique is demonstrated in Video 1.

Postoperative Protocol and Rehabilitation

The patient is placed in a hinged knee brace at the conclusion of the procedure. The initial range of motion restrictions are 0° to 30° for the first 2 weeks and fully unlocked after that time. The patient is toe-touch weightbearing to the effected lower extremity to protect the OCD repair for 4 weeks' time. Physical therapy is started right away to focus on range-of-motion exercises, quad sets, and leg lifts.

Discussion

Treatment of OCD lesions poses a significant challenge for orthopaedic surgeons and can cause debilitating limitations on the activity of patients. Although young, skeletally immature patients may improve with conservative treatment, oftentimes persistent symptoms occur in these patients, with OCD lesions requiring surgical intervention.[9] Each OCD lesion differs based on the patient's skeletal maturity, lesion size, location, and depth, and thus it is important to recognize these features of the lesion and treat each accordingly. There are multiple surgical options to treat OCD lesions with healing rates ranging from 67% to 100% and complication rates ranging from 0% to 44%.[10] A recent study by Kolin et al.[11] showed that with lesion-specific surgery for OCD of the knee with transarticular drilling, drilling and fixation of the lesion or grafting for unsalvageable lesions led to similar improvements in patient-reported outcomes. Another recent article evaluating unsalvageable OCD lesions in skeletally immature patients treated with fresh osteochondral allograft can yield excellent early outcomes

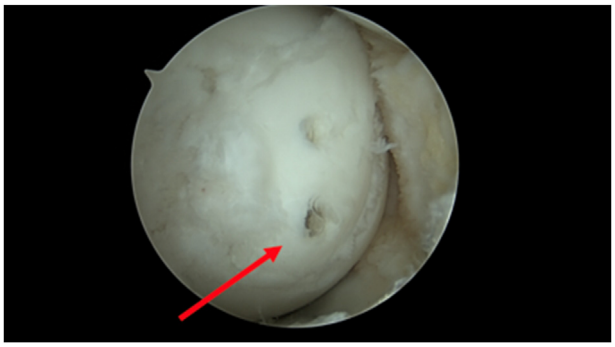

Fig 8. Arthroscopic image of a right knee viewing from the anterolateral portal demonstrating final primary fixation of OCD lesion (red arrow) after bone grafting and placement of 2 bioabsorbable headless compression screws

comparable to skeletally mature patients undergoing the same procedure.[12]

This technical note describes an all-arthroscopic bone grafting technique using cancellous bone allograft to address a medial femoral condyle OCD lesion that is amenable to fixation. There are several pearls to consider when performing this technique, including thorough debridement and preparation of the OCD lesion, marrow stimulation/microfracture of the femoral bed, and proper placement of cancellous bone graft to give structural support to the cartilage and aid the repair process[13-16] (Table 1). A Yankauer suction tip is an easy and accessible tool that can be used to place the cancellous bone allograft. More specifically it is a strong, see-through device of an appropriate size that allows for easy bone graft passage and accurate placement with an arthroscopic technique. After placement of the bone graft, it is important to reduce and fix the OCD lesion and ensure a congruent articular surface that will limit shear forces seen by the graft and support fragment healing.[13]

Although this is a straightforward, reproducible technique, it is not without limitations (Table 2). Bone grafting in the setting of arthroscopy can be difficult to ensure the proper placement of the graft and, if not done properly, can potentially lead to bone allograft loose bodies within the joint. This technique is also not applicable to certain patients with OCD lesions who may require other cartilage interventions based on size, location, and other lesion characteristics. We conclude that this technique is a straightforward and reproducible technique for performing an all-arthroscopic bone grafting and primary fixation of a medial femoral condyle OCD lesion.

Table 1. Pearls and Pitfalls

Pearls
Perform a thorough debridement of the OCD fragment and bony bed to allow for anatomic reduction
Create a bleeding bony bed via marrow stimulation to maximize the healing environment
Bone graft to the level of the adjacent subchondral bone
Two points of fixation to prevent instability of the OCD fragment
Pitfalls
Placing too much bone graft could lead to malreduction of the OCD fragment
Risk of hardware loosening/failure
Risk of bone allograft within the joint leading to loose bodies

Table 2. Advantages and Disadvantages of the Technique

Advantages
Minimally invasive technique
Ability to evaluate and treat other intra-articular pathology during arthroscopy
Use of clear, cannulated instruments such as suction tip for ease of visualization and placement of bone graft
Use of compression screws affords compression across the OCD fragment
Disadvantages
Difficult to perform bone grafting while performing arthroscopy
Inadequate fixation of the unstable fragment may result in need for further surgery

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