

Internal Fixation of Osteochondritis Dissecans Using PushLock Suture Anchors



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Abstract: Osteochondritis dissecans (OCD) of the knee is a subchondral bone abnormality that results in the separation of the articular cartilage and bone with subsequent progression to osteoarthritis. Unstable OCD lesions should undergo fixation to preserve the natural contour of the articular surface. Although several fixation procedures have been reported, the appropriate procedure remains unknown. Because the bony portion of the OCD lesion is usually thin, it is difficult to fix firmly with conventional methods. We began fixing OCD lesions with knotless PushLock anchors and sutures and have obtained satisfactory results. This report describes this fixation method that uses the PushLock suture anchor to treat unstable OCD lesions. This procedure also can be applied for traumatic osteochondral fractures.

Osteochondritis dissecans (OCD) of the knee usually occurs in active pediatric, adolescent, and young adult patients and results in the separation of the articular cartilage and the underlying bone with subsequent progression to knee osteoarthritis. Although the exact etiology of OCD remains unclear, separation occurs at either the deep articular cartilage or the subchondral bone. While stable OCD lesions are usually managed conservatively, unstable or detached OCD lesions require surgical intervention, including microfracture or drilling, fixation of the lesion, osteochondral graft, and autologous chondrocyte implantation. If the OCD lesion can heal, accurate surgical reduction and fixation is recommended to preserve the natural contour of the articular surface and avoid reconstructive procedures that are associated with substantial costs and potential morbidity.¹

A variety of fixation techniques are available to treat unstable OCD lesions, including bone pegs,

osteochondral plugs,² bioabsorbable pins and screws,^{1,3} and metal screws.^{4,5} These procedures usually yield satisfactory results. However, it is difficult to fix the lesion firmly, as the bony portion of the OCD is thin. We began treating OCD lesions with knotless PushLock anchors and sutures and found that this procedure could obtain firm fixation. This report describes this fixation method that uses the PushLock suture anchor to treat unstable OCD lesions. This procedure also can be applied for traumatic osteochondral fractures.

Surgical Technique (With Video Illustration)

Surgical Indications

This procedure is indicated for unstable or detached OCD lesions (Fig 1). Before surgery, OCD lesions are carefully evaluated by magnetic resonance imaging (MRI) and graded according to Nelson's classification.¹ Grade 3 (a thin, high-signal rim extending behind the OCD lesion indicating synovial fluid around the fragment) and grade 4 (mixed signal or low-signal loose body in the center of the lesion or free within the joint) are indicated for surgical fixation. This study had institutional review board approval of Hiroasaki University Graduate School of Medicine. Informed consent was obtained from all individual participants included in the study.

Patient Positioning and Diagnostic Arthroscopy

Although this procedure can be performed either under arthroscopy or arthrotomy, a demonstration of

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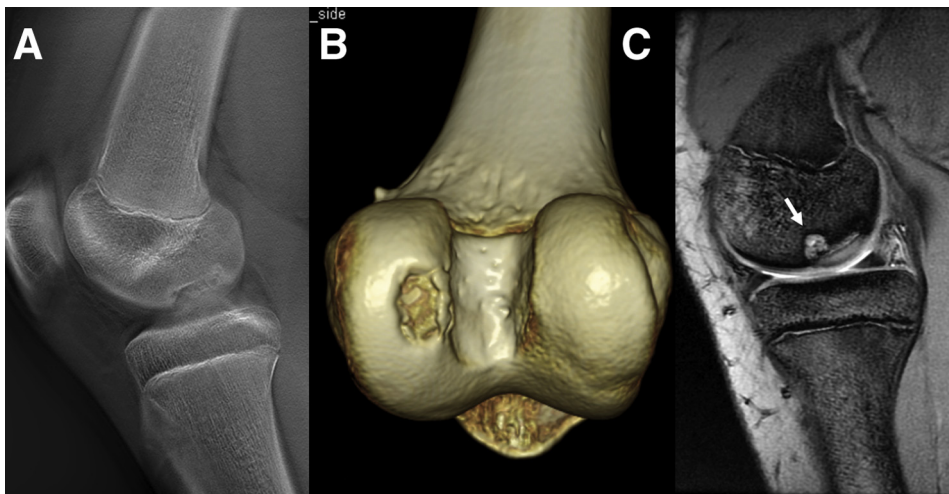


Fig 1. Preoperative images of the osteochondritis dissecans of the medial femoral condyle (13-year-old boy, right knee). (A) Digital tomosynthesis image. (B) Three-dimensional computed tomography imaging. (C) Magnetic resonance imaging, T2-weighted sagittal view shows a cyst (arrow) around the fragment. This indicates an unstable lesion.

open surgery is provided in [Video 1](#). Following the induction of lumbar spinal anesthesia or general anesthesia, the patient is placed in the supine position on a standard operating table. A tourniquet is placed on the proximal thigh, and support plates are placed at the thigh and foot to maintain the knee in approximately 90° of flexion ([Fig 2](#)). Diagnostic arthroscopy is performed to assess the intra-articular lesions and OCD lesions. Any concomitant lesions are treated if necessary. The OCD lesion stability is carefully assessed using an arthroscopic probe ([Fig 3](#)), and any lesion with movement should undergo fixation.

Surgical Technique

After arthroscopic examination, a longitudinal medial parapatellar incision is made ([Fig 4](#)), and medial parapatellar arthrotomy is performed. It is vital to avoid injury of the articular cartilage and medial meniscus.



Fig 2. Patient position (right knee, lateral view). The patient is placed in the supine position, and a tourniquet is placed on the proximal thigh. Support plates are placed on the thigh and foot to maintain the knee in approximately 90° of flexion.

The OCD lesion is exposed, and the extent of the lesion is carefully examined.

A #11 blade was used to cut the articular cartilage along the border of the OCD lesion ([Fig 5](#)). The OCD lesion is hinged like an open door, and the base of the lesion was exposed. The lateral portion of the flap, where the posterior cruciate ligament is attached, should be preserved as a hinge to maintain stability of the flap ([Fig 6](#)). The base of the lesion should be fully debrided using a curette until the underlying healthy subchondral bone is exposed. The backside of the OCD flap is also debrided. The subchondral bone then undergoes the microfracture procedure ([Fig 7](#)). These

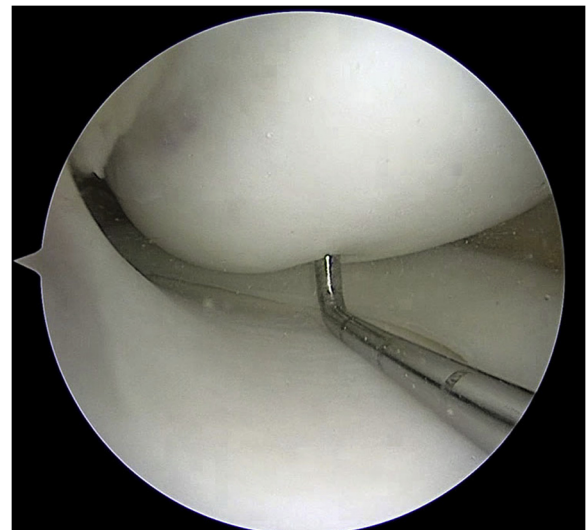


Fig 3. Diagnostic arthroscopy of the right knee (medial compartment). An intra-articular image of the right knee viewed from the anterolateral portal demonstrates a large osteochondritis dissecans lesion located on the medial femoral condyle. (MFC, medial femoral condyle; MM, medial meniscus; OCD, osteochondritis dissecans.)

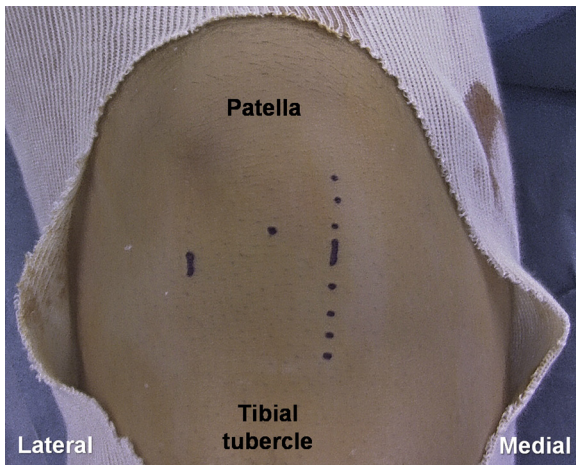


Fig 4. Skin incisions (right knee). The anteromedial portal incision is extended for the medial parapatellar approach (dotted line). (ALP, anterolateral portal; AMP, anteromedial portal.)

steps are important for promoting healing of the lesion. The osteochondral fragment is reduced into the medial femoral condyle and taped with an impactor. While applying firm pressure, the osteochondral fragment is temporarily fixed with a 2.4-mm Kirschner wire (K-wire) (Fig 8).

We usually fix the OCD lesion in a triangular shape with 3 PushLock suture anchors (the 2.4-mm Bio-Composite Knotless PushLock suture anchor, Arthrex, Naples, FL) and sutures for this technique. The K-wire hole that is used for temporal fixation becomes one of the corners of the triangle. SutureTape (AR-7521; Arthrex) or doubled 2-0 FiberWire (AR-7221; Arthrex) is threaded through the PushLock eyelet. First, a bone socket is made using a drill for the 2.4-mm PushLock,

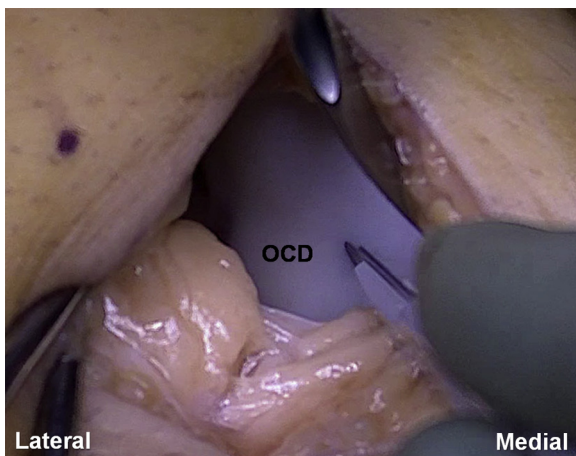


Fig 5. Demarcation of the lesion (through the medial parapatellar approach). The articular cartilage along the border of the osteochondritis dissecans lesion is cut using a #11 blade. (OCD, osteochondritis dissecans.)

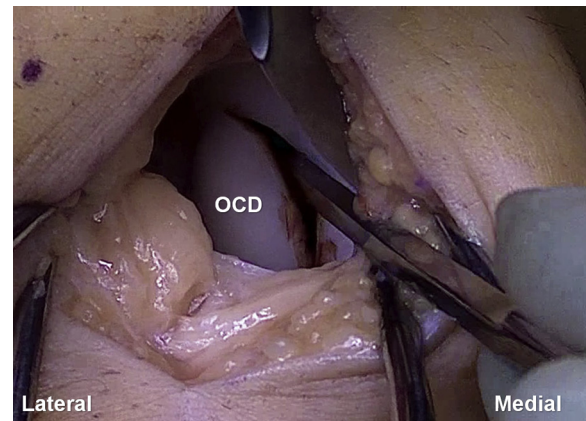


Fig 6. Exposure of the base of the lesion. The osteochondritis dissecans lesion hinges like an open door, and the base of the lesion is exposed. (OCD, osteochondritis dissecans.)

then the anchor, with the passed suture, is placed into the bone socket (Fig 9). The driver is advanced into the bone socket until the anchor body contacts the bone. The orange packaging clip is removed, and the metal button on the driver handle is tapped to advance the anchor body until the proximal laser line is flush with the bone (Fig 10). Afterward, the driver is removed. A second PushLock anchor is inserted in the same manner. The suture tension should be adjusted appropriately while the anchor is in contact with the bone. The K-wire is removed, and the drill hole is used for the third PushLock anchor. Under appropriate tensioning of the suture, the third PushLock anchor is inserted.

The suture is cut flush using a FiberWire suture cutter (Arthrex), and the OCD lesion stability is confirmed (Fig 11). The excised fat pad and retinaculum are sutured with bioabsorbable sutures, and the skin incisions are closed using skin tape.

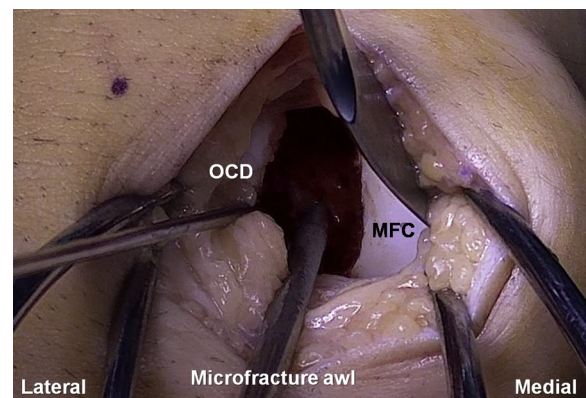


Fig 7. Curettage and microfracture of subchondral bone. After curettage of debris and fibrotic tissue on the subchondral bone, microfracture is performed to promote bleeding. (MFC, medial femoral condyle; OCD, osteochondritis dissecans.)

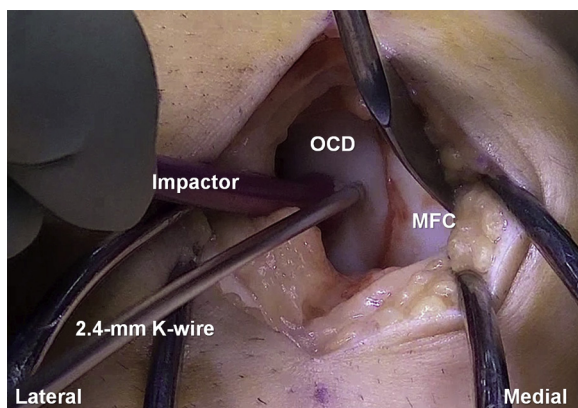


Fig 8. Reduction of the osteochondral dissecans fragment. The osteochondral dissecans is reduced into the medial femoral condyle, and is temporarily fixed with a 2.4-mm Kirschner wire under pressure on the osteochondral dissecans by an impactor. (K-wire, Kirschner wire; MFC, medial femoral condyle; MM, medial meniscus; OCD, osteochondritis dissecans.)

Postoperative Rehabilitation

The knee is kept in extension using a brace, and non-weight-bearing is advised for 2 weeks after surgery. Muscle control exercises, including patellar setting and straight-leg raising, begin the day after surgery. Range of motion exercises and partial weight-bearing begin on the third week, and full weight-bearing walking is permitted from the fifth week. Return-to-sporting activities are recommended 4 to 6 months postoperatively upon confirmation by MRI or digital tomosynthesis that the lesion was healed.

Discussion

We introduce a fixation technique for an unstable OCD lesion using the PushLock anchor and suture

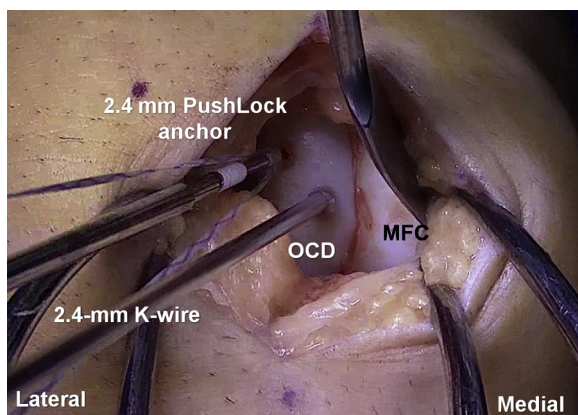


Fig 9. Fixation of the osteochondral dissecans with the PushLock anchors. PushLock suture anchors (the 2.4-mm BioComposite Knotless PushLock suture anchor, Arthrex, Naples, FL) with SutureTape (AR-7521; Arthrex) are inserted into the first bone socket. (MFC, medial femoral condyle; OCD, osteochondritis dissecans.)

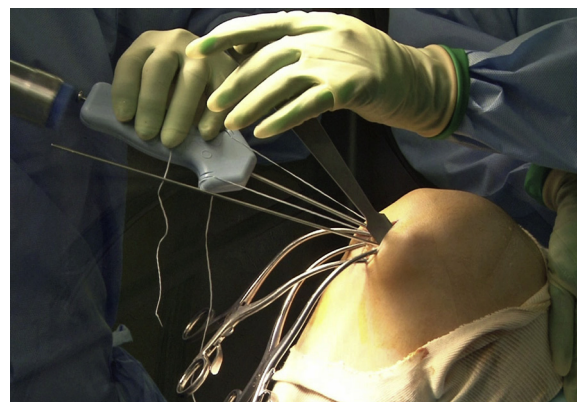


Fig 10. Final insertion of the first anchor (viewed from the medial side of the right knee). The metal button on the driver handle is tapped to advance the anchor body until the proximal laser line is flush with the bone.

together. Recently, Chernchujit and Artha⁶ have reported a similar technique to fix an OCD lesion using a suture anchor. An advantage of our technique is that there is no need for suture tying. The osteochondral lesion can be fixed and pressed down over a wide area in a triangular structure similar to the suture bridge technique for rotator cuff tears. Based on our biomechanical study that compared the initial fixation strength of this technique with bioabsorbable pins and osteochondral plugs, this technique showed the greatest initial fixation strength (unpublished data). We believe that this technique attains strong fixation and improves the OCD fixation results. Reliable fixation by the PushLock anchor and suture facilitates an aggressive postoperative rehabilitation program. Thus far, our short-term results of this procedure are satisfactory.

There are several approaches to treat unstable or detached OCD lesions, including internal fixation of

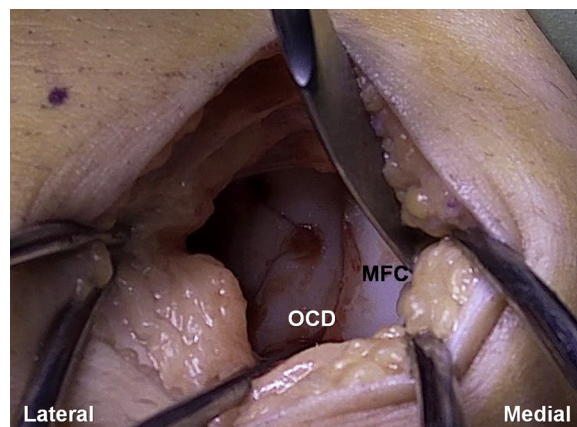


Fig 11. Final fixation using PushLock anchors and sutures. The osteochondral dissecans lesion is firmly fixed by PushLock anchors and sutures. (MFC, medial femoral condyle; OCD, osteochondritis dissecans.)

Table 1. Advantages and Disadvantages of Internal Fixation of Osteochondritis Dissecans Using the PushLock Anchor

Advantages	Disadvantages
Bioabsorbable anchor	Suture lies on the surface of the articular cartilage
Anchor is completely buried under the cartilage	Cartilage damage during drilling for anchors
Anchor removal is unnecessary	No long-term results
Strong initial fixation with suture	
Facilitates postoperative rehabilitation	

the lesion, or bone and cartilage reconstruction techniques such as microfracture, osteochondral autograft transfer, and autologous chondrocyte transplantation. When the unstable OCD fragment is well preserved, the fragment should be fixed to preserve the natural contour of the distal femur and decrease the development of secondary osteoarthritis.¹ For reliable bone fusion, an important step is curettage of the base of the lesion until the underlying healthy subchondral bone is exposed, with microfracture (or drilling) of the subchondral bone.⁵ Ishikawa et al.⁷ have reported the results of in situ arthroscopic fixation on stable juvenile OCD lesions in the knee and report a 23% failure rate. They strongly suggest a less-invasive approach, in which great care is taken for lesions with unstable findings on MRI even if they are arthroscopically stable. Therefore, in our patient, we cut the articular cartilage, and the OCD lesion was reflected to expose the base of the lesion.

Although we do not have data on the initial fixation strength of the metal screw, it may not be as strong as we expect because OCD lesions have a thin bone component. Moreover, the metal screw needs to be removed if the cartilage becomes worn. Notably, there is no need to remove the absorbable implant. However, an MRI study after bioabsorbable nail fixation has shown that nail breakages are observed in approximately one-third of the cases and are associated with the presence of pain and/or effusion.⁸ Furthermore, nail breakage and nail protrusion may result in meniscal and chondral damage. We experienced similar bioabsorbable pin fixation complications and have abandoned their use. Although theoretically the PushLock could back out, it seems unlikely because PushLock is completely secured within the bone.

The advantages and disadvantages as well as the pearls and pitfalls of this procedure are summarized in Tables 1 and 2.

Table 2. Pearls and Pitfalls of Internal Fixation of OCD Using the PushLock Anchor

Pearls	Pitfalls
The OCD lesion is hinged similar to an open door to maintain stability	Underestimation of the instability of the OCD lesion by arthroscopy
Curettage of the base of the lesion	Overtensioning or undertensioning of the suture during PushLock anchor insertion
Microfracture of the subchondral bone	
Optimal tensioning of the suture during insertion of the PushLock anchor	

OCD, osteochondritis dissecans.

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