

Arthroscopic Fixation of Osteochondritis Dissecans of the Knee Using a Motorized Pick and Headless Compression Screws



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Abstract: Osteochondritis dissecans (OCD) of the knee affects children and adolescents. The condition is characterized by sterile osteonecrosis of the subchondral bone. The cause is unknown. OCD is divided into juvenile or adult type, depending on whether the physis is open or closed at the time of diagnosis. Stable juvenile OCD lesions have substantial healing potential and are treated conservatively, with a healing potential of up to 75%. However, in unstable lesions and in all symptomatic adult OCD lesions, surgical treatment is indicated. The purpose of this article was to present our method of arthroscopic fixation of an unstable OCD in the knee, using a motorized pick to stimulate the bed of the lesion, and firm fixation with headless screws. The advantage of this method is the controlled and meticulous debridement and stimulation of the sclerotic necrosis behind the OCD fragment and the firm compression achieved with the screws, enabling an intensive and early rehabilitation.

Osteochondritis dissecans (OCD) of the knee is a well-recognized condition that affects children and adolescents.¹ The condition is characterized by sterile osteonecrosis of the subchondral bone, which can lead to a spectrum of clinical symptoms, ranging from asymptomatic stable lesions to loose fragments causing locking and swelling. The cause is unknown.

OCD is divided into juvenile or adult type, depending on whether the physis is open or closed at the time of diagnosis. Most commonly, the medial femoral condyle of the knee is affected (Fig 1), but lesions may also occur at the lateral condyle, the trochlea, or the patella.

OCD lesions are classified according to the classification of the International Cartilage Repair Society (ICRS).²

Grades I and II are stable lesions with variable degrees of cartilage disruption, whereas grade III is an unstable lesion left in place (dead in situ). In grade IV, the fragment has become loose in the joint (empty bed). Stable juvenile OCD lesions (ICRS OCD grades I and II) have substantial healing potential and are treated conservatively, with a healing potential of up to 75%.³ However, in unstable lesions (grades III and IV) and in all symptomatic adult OCD lesions, surgical treatment is indicated. The purpose of this article was to present our method of arthroscopic fixation of an unstable OCD in the knee, using a PowerPick tool (Arthrex, Naples, FL) to stimulate the bed of the lesion and fixation with 3.0-mm Headless Compression Screws (HCSs) (Synthes, Solothurn, Switzerland) (Video 1).

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Surgical Technique

The benefit of the present technique is the all-arthroscopic fixation, avoiding an arthrotomy, the stimulation of the subchondral bone with the Power-Pick, and the firm compression obtained by the HCSs.

Patient Positioning

The patient is in the supine position. We use a tourniquet inflated to 250 mm Hg placed as proximally as possible on the thigh. A lateral side support at the level of the tourniquet is used to enable valgus stress during arthroscopic evaluation of the knee. A footrest is not used. A single dose of prophylactic antibiotics according

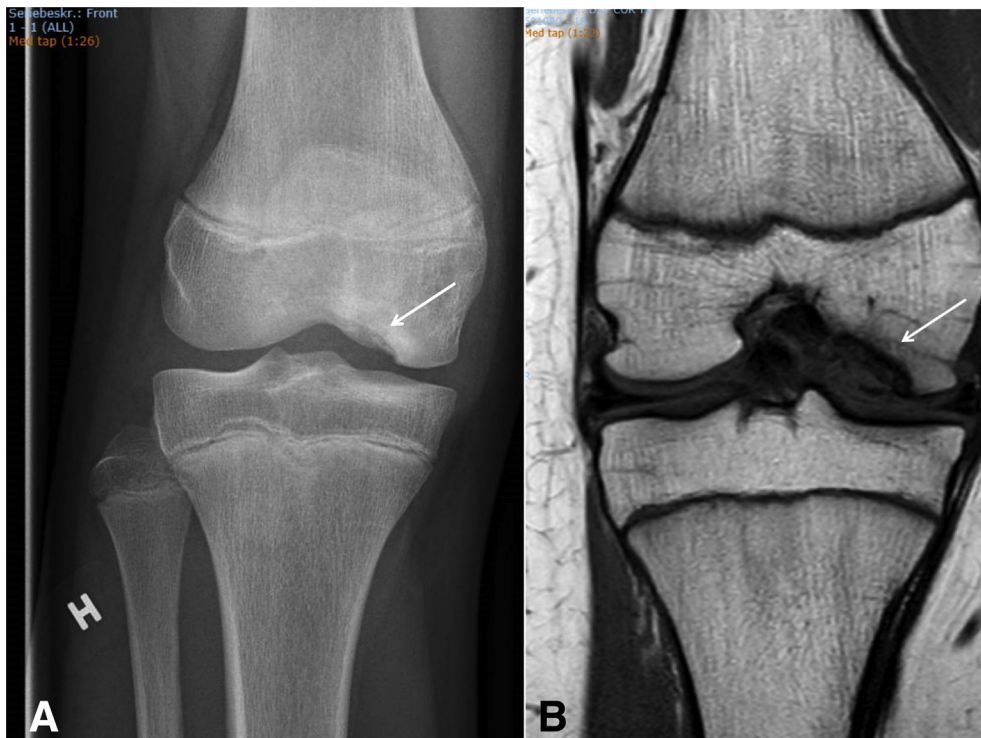


Fig 1. Anteroposterior radiograph (A) and coronal-plane magnetic resonance image (B) of the right knee in a 12-year-old girl. One should note the classic location of a juvenile osteochondritis dissecans lesion in the lateral aspect of the medial femoral condyle (arrows).

to our institutional guidelines is administered intravenously half an hour before tourniquet inflation.

Evaluation of Lesion

After a clinical examination of the knee with the patient under anesthesia, a high lateral portal is made and the camera is inserted as usual. We prefer to use a needle to determine the best position for the working portal because the optimal placement depends on the location of the lesion. The OCD is normally quickly identified, most often localized on the lateral aspect of

the weight-bearing area of the medial condyle, toward the notch. However, in some cases, the cartilage over the fragment appears intact, and the fragment is identified through tactile palpation with an arthroscopic hook (Fig 2).

A formal arthroscopic evaluation of all compartments of the knee is performed, and any other pathology is addressed. The status of the menisci and ligaments is noted. The lesion is then identified, and the stability is tested with an arthroscopic hook. If there is any movement of the lesion, we proceed to fixation.

Fig 2. Osteochondritis dissecans (OCD) in the medial femoral condyle of the right knee in a 12-year-old girl, viewed through the antero-lateral portal. (A) The medial condyle appears normal. (B) The outline of the lesion is identified as the arthroscopic hook is used to vigorously test the stability of the fragment.

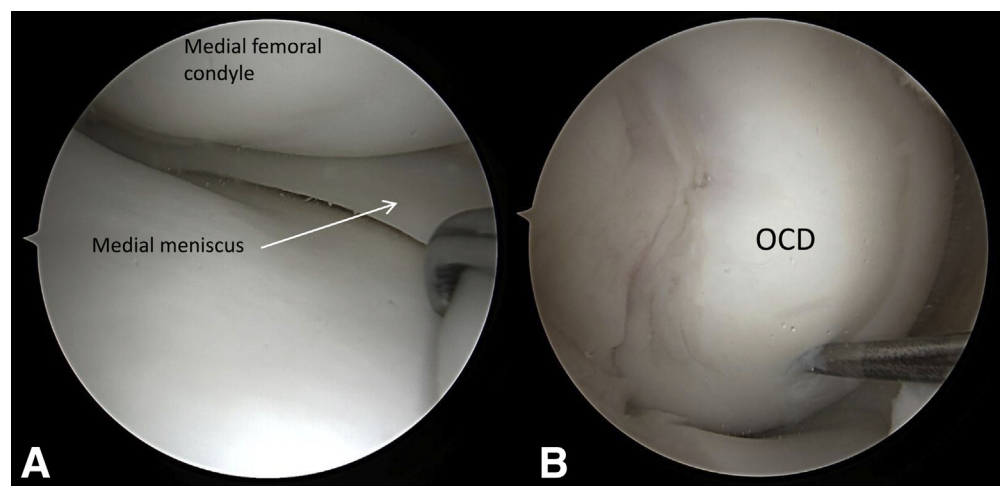


Table 1. Pearls and Pitfalls of Arthroscopic Fixation of Osteochondritis Dissecans of Knee Using PowerPick and Headless Compression Screws

| Stage | Pearls | Pitfalls |
|----------------------------|---|--|
| Hinging lesion open | Use a knife to sharply incise any overlying cartilage to free the lesion. | Make sure the lesion is attached on 1 side to avoid losing it in the joint. |
| Preparation of bed | Change portals to gain access to all areas of the bed and lesion. | Avoid too much bone loss when removing the sclerotic tissue. |
| Compression screw fixation | Start with a central screw for optimal compression of the fragment. | Make sure the guidewires are parallel to avoid cross pinning the fragment, impeding compression. |

Hinging of Lesion Open and Preparation of Subchondral Bed

The lesion is hinged open, leaving 1 side attached to avoid losing the fragment in the joint (Table 1). In cases with healthy overlying cartilage, the lesion has to be cut free with a sharp blade (Fig 3). Once the lesion is hinged, it is opened with an arthroscopic elevator or similar blunt instrument. The subchondral surface of the bed is then prepared with a ring curette, removing any sclerotic tissue (Fig 4). Debridement of the sclerotic layer is mandatory to ensure a fresh surface for the fragment to heal back onto. The backside of the fragment is also scraped free of sclerosis. The PowerPick is used to perform microfracture of the bed of the lesion to increase vascularity to the OCD fragment. The PowerPick has a drill depth of 4 mm, whereas the PowerPick XL (Arthrex) has a drill depth of 6 mm, which can be considered in cases with substantial sclerosis to ensure that the microfracture reaches the vascularized subchondral area of the metaphysis.

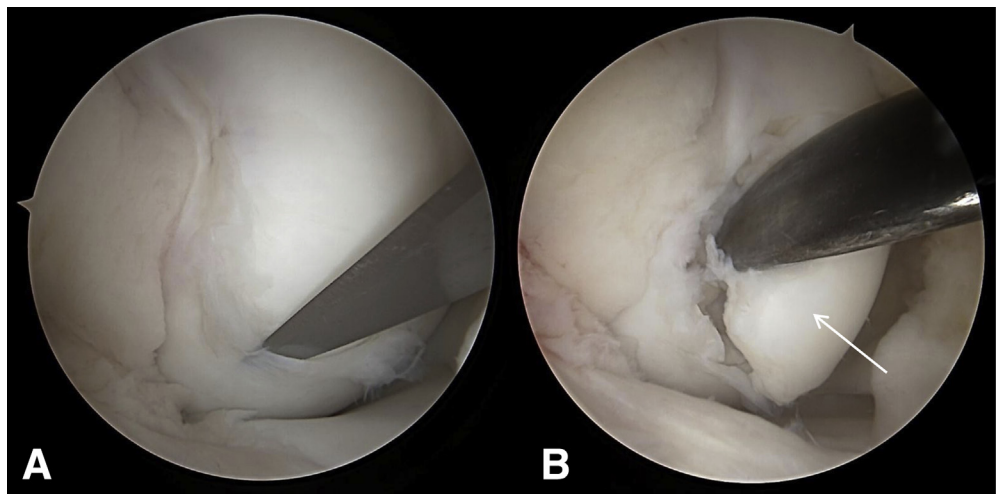
Reduction and Internal Fixation

Once the bed of the lesion is adequately prepared, the lesion is reduced anatomically and fixed with 1.1-mm guidewires (Fig 5). The guidewires are placed where the future screws are intended to be placed. Cross

pinning the fragment should be avoided because this may impede the compression of the fragment. Additional portals are sometimes necessary, but different degrees of flexion of the knee often enable the use of the same portal for fixation in different areas of the lesion.

The guidewires are overdrilled using the 2.0-mm drill bit. The drill is advanced through the fragment and into the subchondral bone—but not further—to ensure good purchase of the screws in the metaphysis of the femur. A measuring device is used to determine the length of the screw. The first 3.0-mm self-tapping HCS is threaded into the tip of the compression sleeve and advanced into the bone over the guidewire. As the compression sleeve reaches the cartilage surface of the lesion, it drives the fragment into the bed as the screw is advanced further, compressing the fragment into the condylar bone. Once adequate compression is achieved, the compression sleeve is held stationary or retracted completely, as the screwdriver is used to advance the screw to its final position beneath the cartilage surface (Fig 6). Burying the screw below the level of the cartilage avoids iatrogenic cartilage damage to the tibia or patella during range of motion. The first screw is inserted completely before the next guidewire is overdrilled to avoid loss of reduction (Fig 7).

Fig 3. Osteochondritis dissecans in the medial femoral condyle of the right knee in a 12-year-old girl, viewed through the anterolateral portal. The overlying cartilage is cut free with a sharp blade (A), liberating the fragment (arrow), which is then hinged open using a blunt arthroscopic elevator (B).



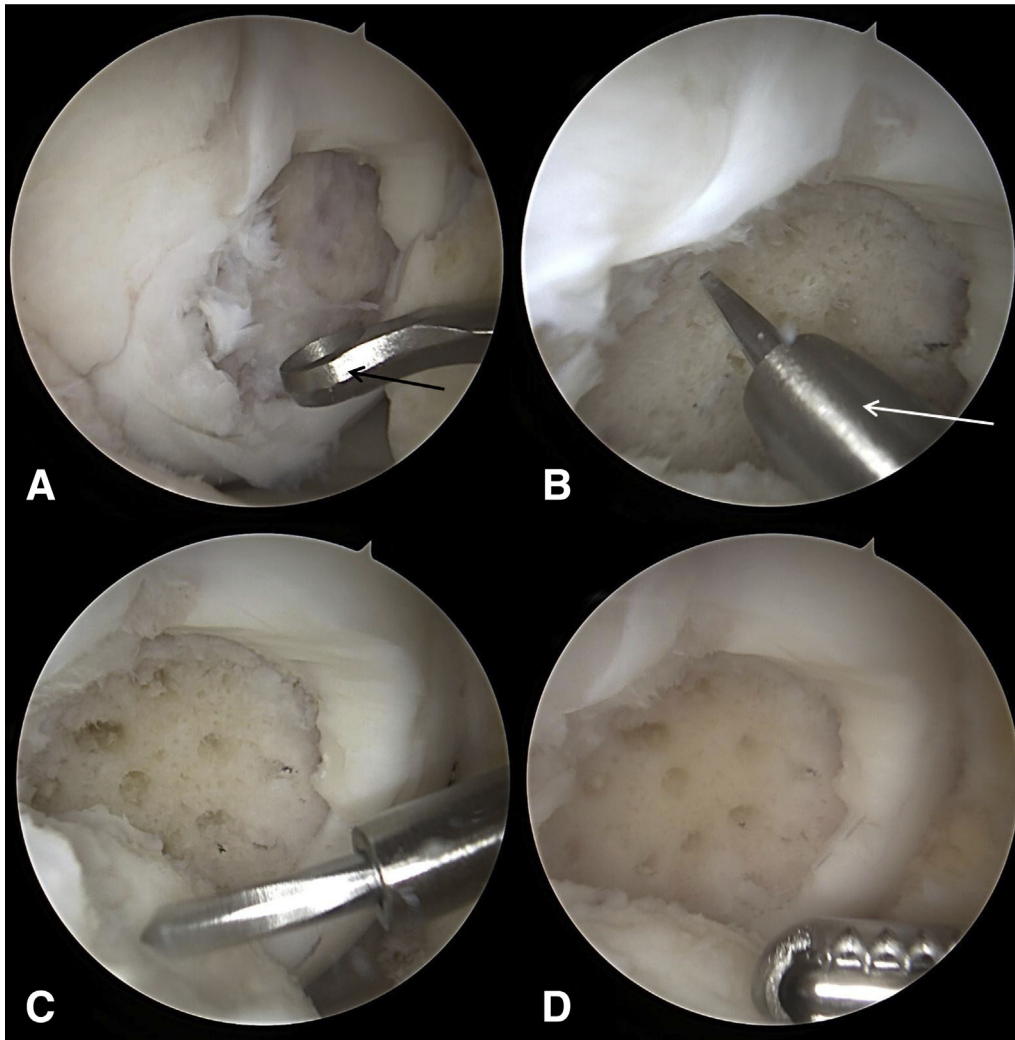


Fig 4. Preparation of subchondral bone in a case of osteochondritis dissecans in the medial femoral condyle of the right knee in a 12-year-old girl, viewed through the anterolateral portal. (A) A ring curette (black arrow) is used to remove the sclerotic layer in the bed of the lesion. (B) The PowerPick (white arrow) is used to perform microfracture of the bed of the lesion to improve vascularity. (C) The backside of the fragment is also prepared. (D) Final debridement of soft tissue with a shaver.

Fig 5. Osteochondritis dissecans in the medial femoral condyle of the right knee in a 12-year-old girl, viewed through the anterolateral portal. (A) Reduction of the fragment with a blunt instrument. (B) Fixation with 1.1-mm guidewires (arrow).

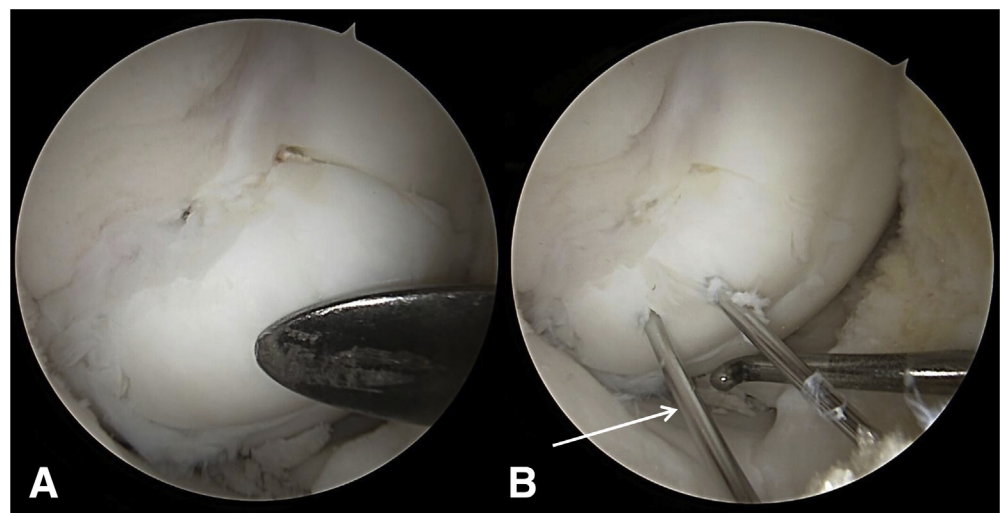


Fig 6. Compression of the fragment with a 3.0-mm Headless Compression Screw (HCS) in a case of osteochondritis dissecans in the medial femoral condyle of the right knee in a 12-year-old girl, viewed through the anterolateral portal. (A) The guidewire is overdrilled by the 2.0-mm cannulated drill bit (white arrow) through the fragment and into the subchondral bone. (B) The HCS is inserted over the guidewire. (C) The compression sleeve (black arrow) attached to the head of the HCS ensures compression of the fragment as the screw enters the bone. (D) When sufficient compression is obtained, the compression sleeve (black arrow) is retracted or held stationary, and the screw is advanced into the cartilage, burying the screw beneath the cartilage surface.

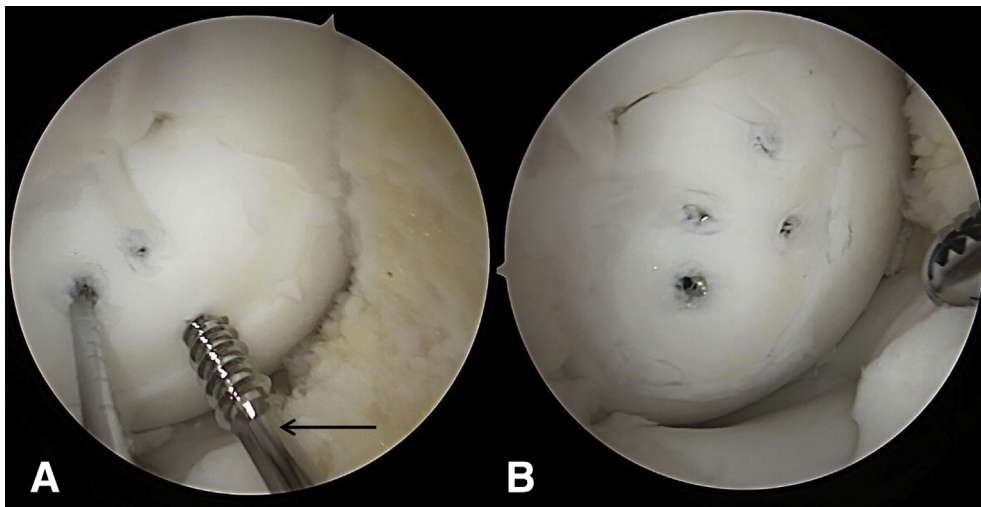
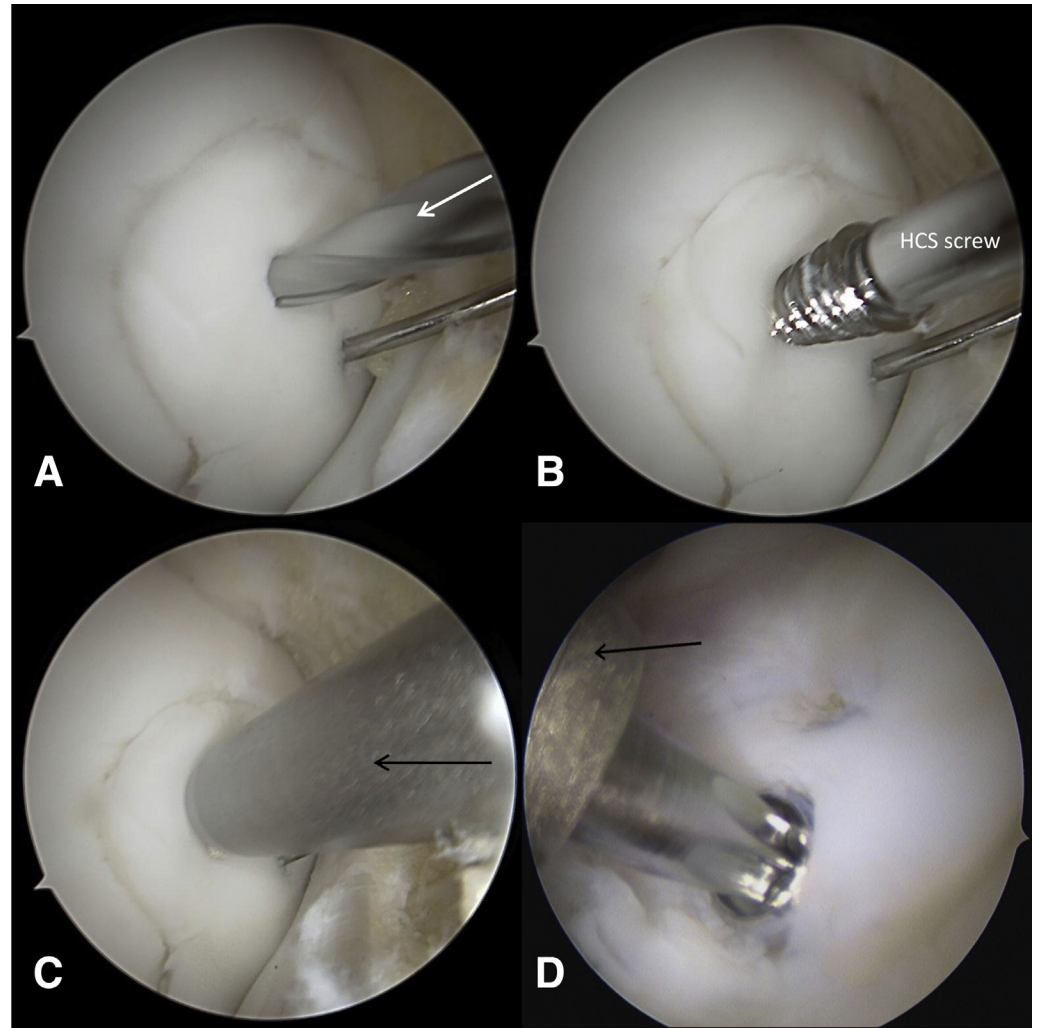


Fig 7. Final fixation of the fragment in a case of osteochondritis dissecans in the medial femoral condyle of the right knee in a 12-year-old girl, viewed through the anterolateral portal. (A) The final screw is inserted (arrow). (B) Final fixation of the osteochondritis dissecans fragment with 4 HCSs.

Table 2. Advantages and Disadvantages of Arthroscopic Fixation of Osteochondritis Dissecans of Knee Using PowerPick and Headless Compression Screws

| |
|---|
| Advantages |
| The procedure is performed in an all-arthroscopic manner with a quick recovery. |
| There is no need for implant removal. |
| Disadvantages |
| If substantial bone loss occurs, bone grafting is difficult. |
| If nonunion occurs, the fragment may collapse and the screws may become loose inside the joint. |

Postoperative Management

The lesion is treated as a fracture, which takes 6 to 8 weeks to unite. If no other concomitant procedures have been performed (e.g., meniscal repair), protected weight bearing with crutches is recommended for 6 weeks. Range-of-motion exercises and quadriceps activation are commenced the first postoperative week. We trust the fixation to permit both cycling with little resistance and quadriceps exercises as soon as the swelling and pain permit. After 6 to 8 weeks, full weight bearing and increased quadriceps strengthening exercises are allowed. The return to sport is individualized, but in uneventful cases, the return to sport might occur as soon as 12 weeks after surgery.

Discussion

The purpose of this article is to present our preferred fixation method of unstable OCD lesions of the knee. Compression screws have been used arthroscopically since Whipple⁴ introduced a cannulated version of the Herbert screw in the 1980s, initially developed for scaphoid fractures. The newer generations of compressions screws, such as the Acutrak (Acumed, Hillsboro, OR) and HCS, are in routine use, especially in hand and foot surgery. There also has been a long tradition of using screw fixation of unstable OCD lesions of the knee joint, either openly or arthroscopically.^{5,6} We prefer metal screws, but bioabsorbable implants are also an option.⁷ Our method is similar to previously published methods.⁸ However, the surgical technique using the PowerPick to stimulate the bed of the lesion in combination with HCSs has not been previously described to our knowledge. This surgical technique is possible for most unstable ICRS OCD grade

III lesions and some grade IV lesions if the fragment is considered salvable with good, viable bone stock. In stable juvenile lesions (ICRS OCD grades I and II), we prefer to stimulate the lesion with retrograde drilling without fixation to avoid unnecessary implants, although some authors recommend fixation with screws also for stable lesions.⁸

The firm fixation of the HCSs facilitates an aggressive postoperative rehabilitation program, with immediate range-of-motion exercises and quadriceps activation. In our experience, the pain and symptoms from the OCD disappear almost immediately postoperatively once the fragment has been firmly fixed (Table 2). We recommend partial weight bearing for 6 weeks in our patients, but it is important to avoid complete non-weight bearing. We believe early mobilization and weight bearing stimulate healing. Further studies are needed to determine whether partial weight bearing is necessary at all.

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