Juvenile Osteochondritis Dissecans (JOCD) Retroarticular Drilling: Position Assessment Technique

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Summary: Juvenile osteochondritis dissecans (JOCD) is an acquired condition of the joint that affects the articular surface and the subchondral bone in skeletally immature patients. Retroarticular drilling is an accepted option for stable knee JOCD when conservative treatment fails. The primary limitation of this technique is the requirement for fluoroscopy and its associated radiation. Intraoperative fluoroscopy can be a challenge because of the superimposed radiographic density of the musculoskeletal structures that may obscure visualization of the lesion in the lateral view. Consequently, most surgeries require multiple shots for the identification of the lesion and Kirschner-wire placement. We describe a new location assessment system that can, therefore, allow surgeons to more accurately identify the JOCD lesion during retroarticular drilling using radiographic landmarks. This technique may help avoid excessive intraoperative radiation and expedite intervention during the retroarticular drilling of osteochondritis dissecans lesions.

Key Words: juvenile osteochondritis dissecans—magnetic resonance imaging—knee—pediatric—drilling. (Tech Orthop 2021;36: 107–109)

BACKGROUND

Juvenile osteochondritis dissecans (JOCD) is described by Edmonds and Shea1 as a “focal, idiopathic alteration of subchondral bone with risk for instability and disruption of adjacent articular cartilage that may result in premature osteoarthritis.” The juvenile form of the disease (JOCD) presents in those aged 5 to 16 years with open growth plates, and it can affect the knee, elbow, and ankle.2 Cartilage that may result in premature osteoarthritis can affect the knee, elbow, and ankle.2

Surgery is indicated in stable (immobile) lesions not responding to an initial course of nonoperative therapy, and in unstable (mobile) lesions. Surgical treatment for stable lesions of the knee with intact articular cartilage involves drilling the subchondral bone to disrupt the sclerotic margin of the lesion and consequently promote healing via growth factors released from healthy underlying cancellous bone. Arthroscopically confirmed stable JOCD lesions can be drilled either in a transarticular or retroarticular fashion.3

Concerns with transarticular drilling involve the uncertain long-term implications for joint surface damage created by articular cartilage drill sites. The primary limitation of retroarticular drilling is the requirement for fluoroscopy and its associated radiation. The author described a novel technique for anatomic localization of JOCD lesions that can, therefore, allow surgeons to more accurately identify the JOCD lesion during retroarticular drilling using radiographic landmarks. This technique may help avoid excessive intraoperative radiation and expedite intervention.

TECHNIQUE

Preoperative Planning

Using magnetic resonance imaging T1-weighted sagittal sequence, the lesion is identified in its maximum extension (Fig. 1A). This image is transferred to the lateral radiograph, and 3 lines are marked: (1) anterior femoral cortex, (2) mid-diaphyseal (coincident with the central ridge of the physis), and (3) posterior femoral cortex. Thereafter, the 4 zones are localized. Most osteochondritis dissecans lesions are located in zones 3 and 4. The extension of the lesion in the zones, and its most central point are determined (Figs. 1B, C).

Intraoperative

The patient is placed supine on a radiolucent table. A tourniquet is placed on the surgical leg and is inflated to a pressure of 300 mm Hg. A diagnostic arthroscopy is performed through the standard anterolateral and anteromedial portals. The articular cartilage is carefully visualized and probed to ensure no cartilage lesions or flaps are present. The osteochondritis dissecans lesion is then graded according to the ROCK classification.4 Retroarticular drilling is indicated in immobile lesions (cure ball, shadow, and wrinkle in the rug). Under fluoroscopic guidance, a 0.062-inch Kirschner (K) wire is placed percutaneously using the free-hand technique at a level below the physis, and directed obliquely, down through the femoral condyle in a retrograde fashion. Accurate placement of the central K-wire is checked under anteroposterior, notch, and lateral fluoroscopic views. The first placed K-wire should be located in the most central point, as preoperatively determined in the described technique. Multiple parallel K-wires are placed percutaneously, 3 to 5 mm away from each other, using a free-hand technique (Fig. 1D). After drilling, a tourniquet is released, the arthroscopic portals are closed with subcuticular sutures, and dressing with a bandage is then applied.

Postoperative

The patient is kept non–weight-bearing for 6 weeks, but immediate range of motion is allowed. Weight-bearing is then advanced, and physical therapy is prescribed for range of motion and strengthening. Radiographs are assessed at 6-week intervals for evidence of healing (Fig. 2).

DISCUSSION

Arthroscopic drilling is a safe and effective method for the treatment of JOCD lesions with an intact articular surface. This technique aims to revascularize and regenerate the subchondral lesions by the migration of pluripotent mesenchymal stem cells.5 Drilling techniques used in clinical practice for stable lesions include retroarticular, transarticular, and intracondylar drilling. Arthroscopic intracondylar drilling is best suited to...
lesions that affect the intracondylar notch. Transarticular and retroarticular approaches have comparable radiographic healing at 86% and 91%, respectively. A recent publication has shown that retroarticular drilling is the preferred modality between POSNA members. Retroarticular drilling spares articular cartilage damage and allows for the addition of bone graft. The main disadvantage is the requirement for fluoroscopy and its associated radiation exposure. JOCD lesions are easy to visualize intraoperatively on anteroposterior and notch views. However, the intraoperative lateral view can be a challenge, because the superimposed radiographic density of the musculoskeletal structures may obscure visualization. Consequently, most surgeries require multiple shots for the identification of the lesion and K-wire placement, resulting in a high radiation exposure.

This article described a novel technique based on magnetic resonance imaging T1-weighted sagittal sequence and radiographic images that can, therefore, allow surgeons to more accurately identify the lesion during retroarticular drilling using preestablished landmarks. Cahill et al described a system for anatomic localization of JOCD lesions by charting the anterior-posterior and lateral radiographs. The diagram is constructed in the lateral view by continuing the line of the posterior femoral cortex distally, and the roof of the intercondylar notch dividing the epiphysis into 3 areas. Although our method presents certain similarities, Cahill’s method has the disadvantage of being based on radiographs, which does not allow a precise evaluation of the complete extension of the lesion, and is not intended to be used for intraoperative guidance. Our technique facilitates the procedure, and helps in easily identifying the location of the lesion without any additional studies. Moreover,

FIGURE 1. A, Using T1-sagittal sequence, the lesion is identified in its maximum extension. B and C, In a lateral radiograph, the sagittal diagram is created by continuing the lines of the anterior and posterior femoral cortex distally, and a mid-diaphyseal coincident with the central ridge of the physis. Zones 1 to 4 are localized. The lesion image is transferred to the lateral radiograph using these landmarks. The extension of the lesion in the zones and its most central point are determined. This point corresponds to the first placed Kirschner wire (arrow). In this particular case, the lesion is mostly located in zone 3 with its most central point between lines 2 and 3 (between mid-diaphyseal line/central physeal ridge and posterior femoral cortex). D, Multiple Kirschner wires are introduced around the first Kirschner-wire using the described landmarks as a guide.

FIGURE 2. Preoperative and 6-month postoperative tunnel view radiograph showing complete healing.
the use of intraoperative landmarks, as described, would shorten the
time of the procedure, and would decrease the radiation time for the
patient and the surgical team. This assumption might be addressed
in future studies.

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