CHAPTER **53**

RETROGRADE DRILLING OF OSTEOCHONDRAL LESIONS OF THE TALAR DOME

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BRIEF HISTORIC REVIEW

Osteocartilaginous loose bodies of the ankle joint were first described by Alexander Munro.[1] He attributed this condition to trauma, but did not classify it as a fracture. Before 1922, terms such as loose bodies, joint mice, and corpora mobile were used to describe this pathologic process. Kappis used the term osteochondritis dissecans, which remains in use today.[2] Berndt and Hardy, ascribed a traumatic etiology and described a staged mechanism of injury with a comprehensive classification system—they used perhaps the most appropriate term, transchondral fracture.[3] By definition, this is a fracture of the articular surface of bone, produced by a force transmitted from the articular surface of a contiguous bone across the joint and through the articular cartilage to the subchondral trabeculae of the fractured bone. This can result in 1 of 2 fracture types—compressed trabeculae, with or without cartilage damage, or avulsion of an osteocartilaginous flake.

ETIOLOGY

The Taro theory proposed to describe the pathologic process of osteochondritis dissecans is either a traumatic origin or an avascular process.[4] Most reported cases in the literature cite trauma as the primary etiology; however, embolic, hereditary, endocrine and developmental factors have all been implicated.[5] Transchondral fracture can present as a late finding of a traumatic event and may be marked by more painful adjacent soft tissue damage. The compressed or avulsed segment of bone injury is susceptible to avascular necrosis and further subchondral bone degeneration. If this process continues, the overlying cartilage can weaken, necessitating joint replacement or reconstructive arthrodesis.

PATHOGENESIS

Osteochondral lesions can occur in any joint as a result of trauma. There are several potential explanations for the higher occurrence of the subchondral fractures in the talus than in the tibial plafond. Camasta et al demonstrated that osteochondral lesions are more commonly observed at the convex surface of a joint, while the concave surface is generally spared.[6] The convex surface is believed to transmit the forces (convergence of force) toward a central focus, whereas a concave surface dissipates the forces. As a result, the concave joint surface (in this case the talus), is likely to be more damaged by trauma (than is the tibial plafond). Athanasiou et al also evaluated the compressive stiffness of portions of the articular surface of the tibiotalar joint.[7] Their investigation found significant increased stiffness of the tibial plafond cartilage compared with the talar dome cartilage, yielding further information as to the more frequent injury to the talar surface of the ankle joint.

IMAGING STUDIES

Standard radiography is a good initial screening method to detect osteochondral pathology; however, it provides limited information for preoperative planning. Technetium-99m bone scans are highly sensitive for osteochondral lesions, but lack spatial imaging to demonstrate the exact size, shape and location of the lesion itself. Computed tomography can aid in location identification of lesions, but are unable to demonstrate cartilaginous pathology. Magnetic resonance imaging (MRI) is the study of choice in detecting cartilaginous, subchondral and fragmentation defects associated with osteochondral lesions. Cystic degeneration and synovial fluid accumulation beneath the subchondral bone plate are well-demonstrated by MRI. This modality can provide the exact size, location and shape of the lesions, aiding the preoperative and intra-operative process.

DISCUSSION

One of the most common questions for the treatment of an osteochondral defect is "When is subchondral drilling indicated?" The authors have found success with retrograde drilling when the overlying cartilage is intact and large subchondral defects are present. Typically when MRI demonstrates subchondral defects greater than 1.5 cm, the authors recommend retrograde drilling and bone replacement. Autogenous bone provides the most compatible healing potential for this bone replacement after retrograde drilling, but a donor site is required for its procurement.

The authors have found success with new bone graft substitute: Osteocel (Osiris Therapeutics, Inc.). Osteocel has recently been introduced in the bone substitute market as the only product that possesses osteoconduction, osteoinduction and osteogenesis. Unlike other products, Osteocel is a cancellous bone matrix that contains viable mesenchymal stem cells, making it the first truly osteogenic product for bone repair.

TECHNIQUE

Once we have identified the viability of the overlying cartilage through MRI or arthroscopy, the plan for retrograde drilling commences. Under general anesthesia, 2 fluoroscopy units are utilized to triangulate the ankle mortise from anterior to posterior and lateral, simultaneously. Either through an open technique or percutaneous method, a 0.062 inch Kirschner-wire is introduced from the talus (sinus tarsi-laterally or body-medially), into the center of the osteochondral lesion (Figure 1). It should not penetrate the subcondral bone of the talar dome. Large cannulated drill systems can then be used over the guide wire under fluoroscopy to debride the non-viable bone. The authors have adapted spinal instruments for drilling and evacuating the non-viable bone defects (Figure 2). Once the defect is prepared, Osteocel is packed into the defect (Figure 3). The site is verified under fluoroscopy and closed in the usual fashion. The typical postoperative course is cast immobilization and nonweightbearing for 4 weeks, followed by ambulation in a cam-walker and physical therapy.

The surgical management of osteochondral defects can range from arthroscopic techniques to autologous chondrocyte transplantation. This technique described here offers a safe and effective method to replace subchondral defects with intact cartilaginous surfaces.

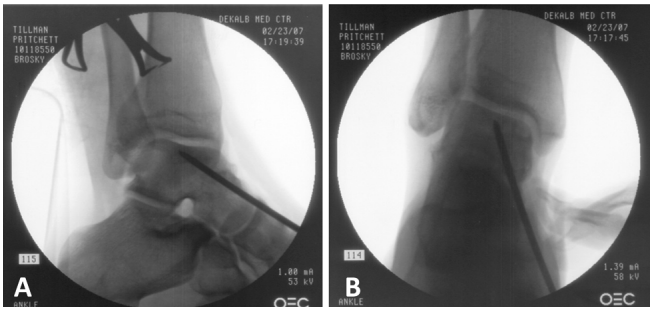

Figure 1. A Kirschner-wire is introduced from the talus into the center of the osteochondral lesion.

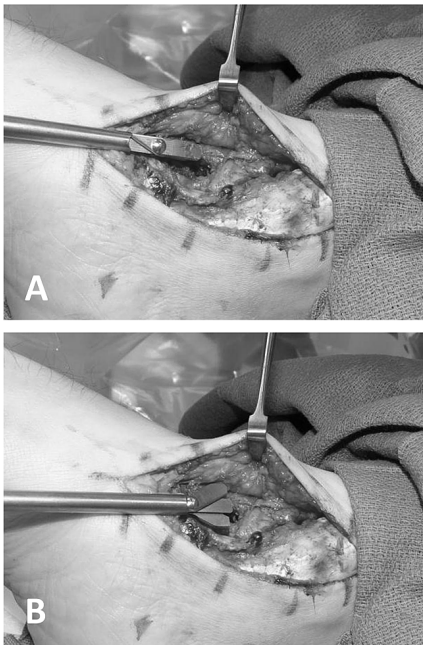

Figure 2. Spinal instruments are used for drilling and evacuating the non-viable bone defects.

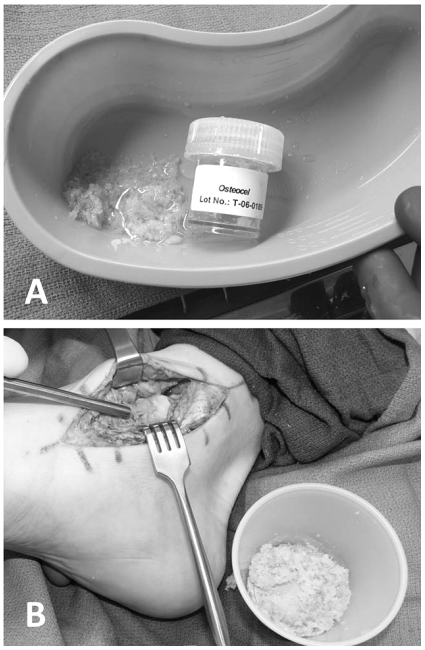

Figure 3A. Osteocel is packed into the defect.

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