CHAPTER **17**

OSTEOCHONDRITIS DISSECANS OF THE DISTAL TIBIA OR SUBCHONDRAL CYST?

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Osteochondritis dissecans (OCD) and subchondral cysts of the distal tibia are rare and perhaps misdiagnosed clinical entities. A remote osseous lesion of the distal tibia is typically assumed to be a bone tumor and pathological specimens should always be taken for a confirmed diagnosis.[1] "Kissing lesions" of the distal tibia (Figure 1), which are mirror image lesions to talar osteochondral lesions, have been described in the literature.[2] There is only mention of a few cases of isolated distal tibial osteochondral pathology.[3-5]

Similar to OCD of the talus, the true etiology is still unclear. Historically, early observations of these lesions was thought to involve spontaneous necrosis of bone and cartilage, hence the name osteochondritis dissecans. Berndt and Harty in 1959 established trauma as the likely etiology to lesions within the ankle talar dome.[6] Similar to OCD of the talus, tibial osteochondral lesions are also likely due to trauma. Shearing forces along with axial compression of the ankle joint during an inversion or eversion type injury is the likely cause of tibial osteochondral pathology.

Osteochondral lesions of the distal tibia are very rare, and hence their scant mention in reported literature.[3-5] In 1994, Camasta, Pitts and Corey explained why the concave joint surface (distal tibia, proximal phalanx) is typically spared while the convex surface (talus, first metatarsal head) is damaged.[7] The differences in trabecular architecture of the joint surface differ in that the concave region has a larger surface area to transmit or diverge force sparing injury. The convex region is routinely fractured due to the smaller surface area and concentration and convergence of forces from trauma.

Clinical signs and symptoms are similar to osteochondral lesions of the talus in which pain is present and increased with activity. Most patients recall a previous history of a traumatic event, such as an "ankle sprain." NSAIDs, ice/elevation, immobilization, and ankle steroid injections may give temporary relief but typically will not last.

Diagnostic tools begin with x-rays of the ankle. Plain radiographs may display a lucency in the area of the distal tibia suggestive of an OCD or subchondral cyst (Figure 2). If there is a "kissing lesion" of the talus, the lucency can appear in the same area opposite of the tibial lesion in the talar dome. The lesion may be outlined

Figure 1A. "Kissing lesions" are anatomical mirror lesions of the tibia and talus.

Figure 1B.

radiographically by the presence of a sclerotic rim, appearing as a radio-dense zone of bone. What cannot be determined radiographically is the integrity of the cartilage or subchondral plate adjacent to the lesion, similar to that which is found in an OCD regardless of location. Magnetic resonance imaging (MRI) can be useful in visualizing the integrity of the subchondral bone plate which some have correlated with the integrity of the articular cartilage (Figure 3). MRI findings can be used as a surgical guide for incision access, and influence the plan with regards to cartilage sparing versus cartilage debriding procedures. Due to the advent of CT and MRI, some authors include a "subchondral cyst" as another category modifying the traditional Berndt-Harty classification.[8-12]

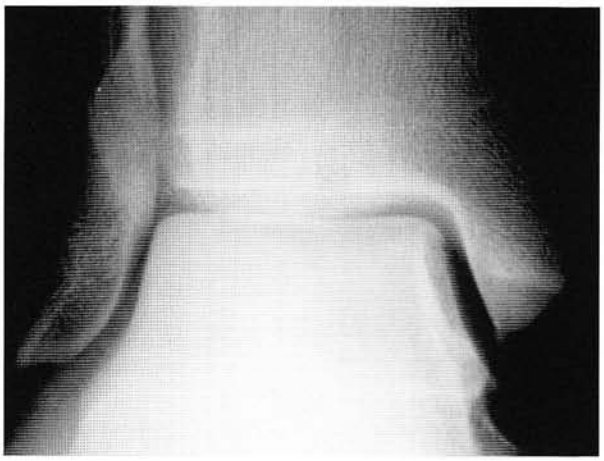

Figure 2. Plain radiographs can demonstrate lucency in the area of the distal tibial OCD or subchondral cyst.

Figure 3A. MRI is superior in visualizing osteochondral pathology with an intact subchondral plate. T2W images will display increased signal intensity at the area of the lesion with a black, sharp line delineating an intact plate.

In 1959, the traditional Berndt-Harty classification of osteochondral lesions was developed based on radiographic appearance.[6]

Stage 1. Small area of compression of subchondral bone
Stage 2. Partially detached osteochondral fragment
Stage 3. Completely detached osteochondral fracture fragment that remains in the defect
Stage 4. Detached and displaced osteochondral fracture fragment

It is important to understand that the Berndt-Harty classification refers only to the talar dome lesions as they appear on plain radiography, and this represents the status of the lesion at the time of evaluation. There is a visual difference in how these lesions will appear depending on the time from injury to evaluation, and a lesion can progress in appearance from a Stage 1 through a Stage 4 lesion depending on whether or not healing has occurred or if the lesion becomes displaced. If an acute talar dome injury goes on to heal, the appearance may not be visible at all. If motion induces avascularity and the lesion fails to heal, then it may appear as a Stage 2 or 3 lesion. Obvious displacement of a fractured fragment appears as a Stage 4 lesion regardless of timing.

With regard to a subchondral cyst, these lesions may represent a later stage of healing (or lack of healing) from a previously appearing Berndt-Harty Stage 1, 2, or 3 lesion where the bone and cartilage that once occupied the void in the subchondral space has been resorbed by

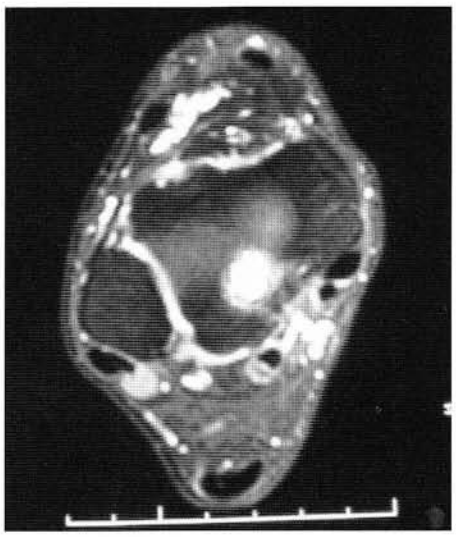

Figure 3B.

inflammation and bony repair. Whether or not the cyst contains any debris of bone and cartilage will determine its appearance on CT and MRI. Likewise, full-thickness violation through the articular cartilage will either allow for flushing-out of debris or containment of this debris (as is the appearance of a true osteochondritis dissecans).

Differentiation of a subchondral cyst and an osteochondral fracture or OCD can be made by observing the intra-operative appearance of the central mass within the lesion. A fluid-filled cyst or subchondral cyst is void of any necrotic bony fragmentation. A true OCD has typical-appearing walled-off fragments of bone with varying degrees of density and location, as well as a sclerotic margin of bone ("bull's eye," "target" lesion) (Figure 3B). Whether the subchondral bone plate is intact or violated should not be used in making the differentiation between subchondral cysts and OCD. Also, no reliable statement can be made regarding the integrity or quality of the articular cartilage short of surgical examination/inspection.

Surgical approaches are limited due to the anatomical position of a distal tibial lesion. Regardless of location on the tibial plafond, it is difficult to achieve good exposure due to the confines of the ankle mortise. Osteochondral grafting theoretically would be a good option, however, it is difficult to gain instrument perpendicularity, which is necessary for the placement of a flush graft.[13] In addition to difficult graft placement, obtaining a suitable shaped graft that contours to the distal tibial plafond is difficult at best. This leaves two viable options for surgical treatment, depending on the integrity of the subchondral plate. If the subchondral plate is visually damaged on MRI or CT, curettage with or without antegrade subchondral drilling can be performed. If the lesion has the subchondral plate fully intact, retrograde drilling is useful to prevent damage to the joint surface.[9, 14-17]

Curettage and antegrade subchondral drilling is the typical surgical approach for OCD. By removing any osteochondral fragments from the joint then penetrating the damaged subchondral bone, bleeding occurs leading to a fibrin clot ultimately filling the defect with fibrocartilage.[6] Advantages include early mobilization and avoiding the need for creating a tibial osteotomy. Results typically reduce pain, but long-term relief is questionable due to the less biomechanical stability of fibrocartilage when compared to normal hyaline cartilage. Another disadvantage to subchondral drilling an OCD lesion with intact articular cartilage is damaging the anatomical articular surface. The procedure can be performed either open or with arthroscopy.[17-19] Kumai et al published results of eighteen ankles undergoing arthroscopic subchondral drilling OCD of the talus through an indirect tibial approach.[19] Subchondral drilling was performed using Kirschner wires perforating the tibia three centimeters above the medial malleolus into the ankle joint gaining vertical access to the talus.

In 1981, Lee and Mercurio first described retrograde drilling for treatment of OCD of the knee and talus.[14] An intact articular surface was either confirmed by preoperative arthrogram or direct intra-operative inspection. The intact cartilage overlying an OCD will typically appear a slightly different color blue or yellow. The procedure for a medial dome lesion is described by using an incision overlying the sinus tarsi. Soft tissue is dissected off the lateral process of the talus and a fine guide pin is inserted toward the lesion with fluoroscopy. A bone biopsy needle or reamer is passed along the guide pin and the lesion is curetted out. If warranted, the defect can be filled with cancellous bone graft. Postoperative care includes non-weightbearing for six to eight weeks. Common postoperative complaints included mild sinus tarsi pain relieved by local injection. Radiolucency, which appeared on preoperative x-ray, had disappeared postoperatively.

In 1996, Conti and Taranow have described a similar procedure using an ankle distracter, arthroscopy, and a percutaneous sinus tarsi incision for instrumentation.[15] A cannulated drill set is used to drill the lesion under fluoroscopy from an approach at the non-articular junction of the neck and body of the talus. The lesion is curetted out and packed with calcaneal bone graft. A Craig biopsy needle is then used to harvest and deposit autogenous calcaneal bone graft. In 1999, they published a study using retrograde drilling for medial talar lesions in sixteen ankles.[9] Mean radiographic healing occurred at seven months. Eighty-eight percent of their patients had radiographic healing, and there were no reported surgical complications.

Isolated OCD or subchondral cysts of the distal tibia should be considered in the differential diagnosis of a post-traumatic painful ankle. Plain radiographs may demonstrate the presence of a lesion, while CT and MRI are useful to differentiate the type and extent of pathology, as well as aid in the surgical planning regarding access to the lesion. An intact subchondral bone plate is suggestive of a viable cartilaginous surface. Differentiating a subchondral cyst from osteochondritis dissecans depends on whether the defect has elements of necrotic bone (OCD) or a fluid-filled cyst void of bony fragmentation.

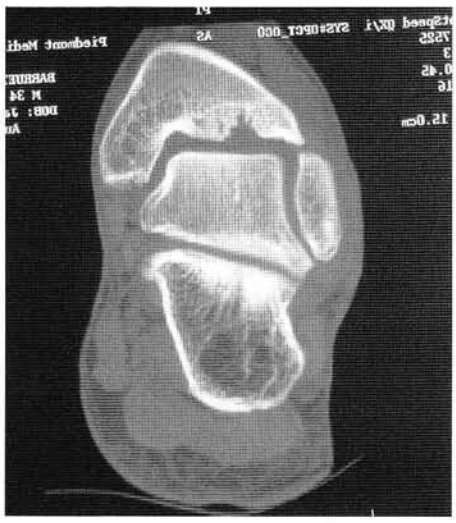

Figure 4A. Case 1. Preoperative CT exhibits a large isolated distal tibial subchondral cyst.

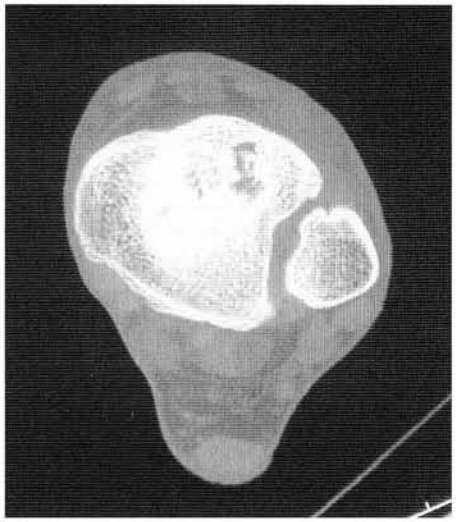

Figure 4B.

CASE 1

A 33-year-old male patient presented with a chief complaint of a painful right ankle from an old injury while playing soccer. He had a plantarflexory type injury and blunt impaction to the anterior ankle. He also had a history of chronic ankle sprains bilaterally in the last few years. CT and MRI reported a significant cyst in the distal lateral anterior tibial plafond (Figure 4). The lesion had bony edema extending beyond the margins of the lesion. The patient complained about pain lasting up to days after physical activity and that he could not participate in desired sports.

The patient was placed under monitored anesthesia care with local infiltration of anesthetic containing epinephrine for surgical hemostasis. The surgical technique began with a 6 cm linear incision over the lateral gutter of the ankle joint. Once the joint was exposed, a synovectomy and excision of loose bodies and osteophytes was performed. Next, through the cartilaginous defect, a 1.2 cm bone cyst was located at the anterior lateral tibial plafond. A curette was used to remove the lesion, which was occupied with cystic bone and a gelatinous-type tissue. The curettage of the subchondral cyst left bleeding cancellous bone. No bone graft was used to fill the defect. The lateral ankle ligaments were also repaired via a modified Brostrom technique.[20]

Postoperative care included non-weight bearing in a removable cast for four weeks. At six weeks, light activity including swimming was allowed. Shortly thereafter, physical therapy utilizing proprioception exercises and light jogging was allowed.

CASE 2

A 25-year-old male presented with a chief complaint of a painful left ankle for approximately one year. He had an inversion type ankle injury while playing basketball and was placed in an orthosis, which gave him temporary relief. Preoperative MRI findings reported "focal benign-appearing, but enhancing, abnormality of the subcortical plafond... it is not developmental, vascular or infectious, but could represent a benign tumorous mass such as giant cell tumor or eosinophillic granuloma, or possibly an area of healing osteonecrosis related to trauma" (Figure 5). An intact subchondral bone plate is clearly visible on the MRI suggesting an intact cartilaginous surface.

Under general anesthesia and with the aid of thigh tourniquet hemostasis, the surgical technique began with arthroscopic evaluation and synovectomy of the ankle joint. The articular cartilage was fully intact with no indication of instability. The Dyanamic Hip Screw System® (AONA Paloli, PA) was chosen for the retrograde drilling instrumentation. Under fluoroscopic guidance, a 2.5 mm guide pin was inserted into the proximal medial tibia approximately 5 cm above the ankle joint in an oblique fashion toward the tibial plafond lesion. To verify pin placement, it was slightly advanced into the ankle joint visualized by arthroscopy. Next a cannulated drill bit was placed over the guide pin to decompress the lesion in an indirect fashion (Figure 6). The guide pin and cannulated drill bit was then removed, and a bone curette was used to remove a biopsy sample and remaining necrotic bone. All

of this was performed proximal to the articular cartilage. Allograft bone chips were then packed into the remaining defect (Figure 7). The lateral ankle ligaments were also repaired via a modified Brostrom technique.[20]

Pathology of the removed specimen reported "fragments of necrotic bone" consistent with that of an OCD. Intra-operative wound cultures of the tibial cyst returned "no growth final." Postoperative care included six weeks of non-weight bearing, the latter three weeks of which included physical therapy with a removable cast.

Figure 5A. Case 2. Preoperative MRI of an isolsated distal tibial OCD. The T1W image displays the lesion with a decreased signal intensity (a).

Figure 5B. The T2W image exhibits the lesion with a strong increase in signtal intensity, visualization of an intact subchondral plate, and the presence of necrotic bone within the defect.

Figure 6A. A cannulated drill bit is placed over the guide pin to indirectly decompress the distal tibial OCD without damaging the underlying subchondral plate and articular cartilage.

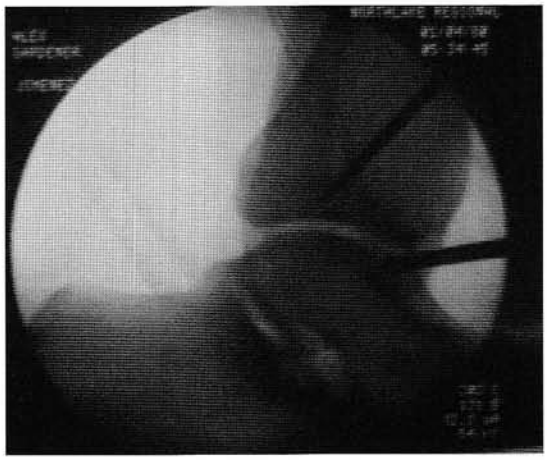

Figure 6B.This is performed with intra-articular visualization by arthroscopy and fluoroscopy.

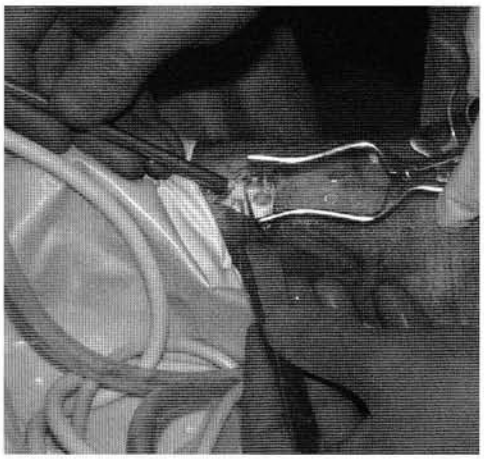

Figure 7. Cancellous bone chips can be utilized to fill the defect after retrograde drilling the osteochondral lesion.

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