CHAPTER 25

ACUTE OSTEOCHONDRAL FRACTURES OF THE TALUS

George S. Gumann, DPM

The philosophy and opinions of the author cannot be construed as reflecting official US Army Medical Department policy.

Osteochondral fractures of the talus are a possible concomitant injury associated with ankle sprains. The literature reports an approximately 6-7% incidence (1, 2). They were first described by Berndt and Harty in 1959 (3). They presented a four-stage classification system (Figure 1). Stage I was an impaction injury. Normally, it is not seen on radiographs; however, it can be seen arthroscopically or directly through an arthrotomy. It can be represented as a bone bruise on magnetic resonance imaging (MRI). Stage II is an incomplete fracture and difficult to identify on a radiograph. Stage III is a complete fracture without displacement. Stage IV is a complete fracture that is displaced. It can be displaced but still remain in its creator or it can be fully displaced lying outside the defect. It can even be rotated 180 degrees with the articular surface resting inferiorly. Berndt and Harty also described the mechanism of injury, morphology and the treatment options for these fractures. The osteochondral fractures were reported as either lateral or medial in their location on the talar dome. Osteochondral fractures of the talus can also be created by ankle fracture mechanisms.

The lateral talar dome osteochondral fracture was described as shallow or wafer-shaped. They are located on the anterior 1/4 or 1/3 portion of the talar dome. This anterior location makes them easily accessible for surgical intervention either arthroscopically or through an arthrotomy. They are trauma related. The mechanism of injury was identified as a foot that was inverted with the ankle dorsiflexed. There was a concurrent grade III injury to the lateral collateral ligaments in stage III and IV (3, 4). The medial talar dome lesion was described as deeper, cup-shaped and located on the posterior 1/3 of the talar dome. This location makes surgical access more problematic. They may be either acute or more commonly of a chronic origin. The mechanism of injury is a foot that was plantarflexed and inverted while the tibia externally rotates (2).

Berndt and Harty recommended nonsurgical treatment for lateral talar dome fractures in stages I and II and in medial talar dome fractures stages I, II, and III. The reason for nonsurgical treatment of medial talar dome fracture stage III was the difficulty in access. Surgical management was recommended for lateral talar dome fractures stages III and IV and for medial talar dome fractures stage IV. The reason for surgical treatment in stage III lateral talar dome fracture was instability of the fragment and a tendency not to consolidate.

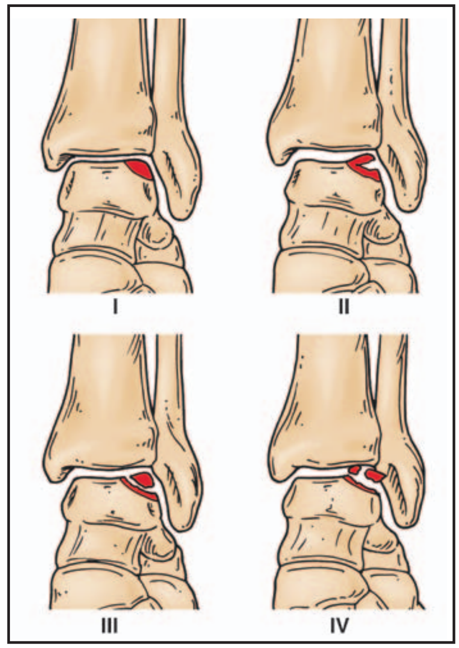

Figure 1. Berndt and Harty classification of osteochondral fractures of the talus.

The injury will present as a typical ankle sprain. There will be varying degrees of edema, ecchymosis, and pain depending on many factors, including the severity of the injury, time from injury to examination, and individual patient variables. There will be limited range of motion of the ankle and foot. There may be an anterior drawer although it may be difficult to ascertain based on the amount of edema, pain, and the presence of muscular guarding. Circulatory and sensory function is usually normal. Routine ankle radiographs generally demonstrate a stage III or IV osteochondral fracture. However, Brendt and Harty reported a 57% misdiagnosis in their study (3). Additional radiograph workup may include a computed tomography (CT) scan or MRI. The CT scan usually produces the best osseous definition of the injury and is the most cost-effective. It is best to remember that both the radiographs and CT scan reveal only the osseous component of the fracture and the articular segment can be larger.

Nonoperative treatment has traditionally been cast immobilization with non-weightbearing for approximately 6-8 weeks (1, 3, 5). If surgical intervention is indicated, the lateral talar dome osteochondral fracture is the easiest to approach. Since it is located more anteriorly on the talar dome, it can be well visualized with either an arthrotomy or arthroscopic approach. It is more commonly approached with arthrotomy. During the dissection, the ruptured fibular collateral ligaments are exposed and the ankle joint revealed. The osteochondral fracture is evaluated and either excised followed by micro-fracture or undergoes open reduction internal fixation (ORIF). The decision is based on the condition of the osteochondral fracture and whether ORIF will produce a congruous articular surface. It is more common to excise the fragment than perform ORIF (Figure 2). This is because the osteochondral fracture many times is comminuted and plastically deformed. The defect is then micro-fractured. This allows bleeding into the defect to form a clot that eventually forms fibrocartilage.

If ORIF is feasible, internal fixation can be achieved with either metallic or absorbable lag screws (Figures 3 and 4). Care must be taken since the osseous portion of the fragment is thin, not to comminute it and to make sure the screw is counter-sunk below the articular surface. Intra-operative radiographs are sometimes difficult to evaluate regarding screw position especially on the lateral projection. If the projection is not a true lateral, it can appear that the screw is actually protruding into the joint. The lateral collateral ligaments are primarily repaired. Postoperative management is a short-leg cast for approximately 6 weeks with an initial period of non-weightbearing. An alternative plan is to excise the lateral talar dome fracture arthroscopically and treat the ligamentous injury nonoperatively with cast immobilization. Arthroscopic excision may be problematic because significant edema can obsure landmarks of the ankle, the hemarthrosis may obscure the fragment,

Figure 2A. Stress radiograph of an acute ankle injury demonstrating a grade III ankle sprain with positive anterior drawer and talar tilt along with a lateral talar dome osteochondral stage IV fracture.

Figure 2B. Stress radiograph.

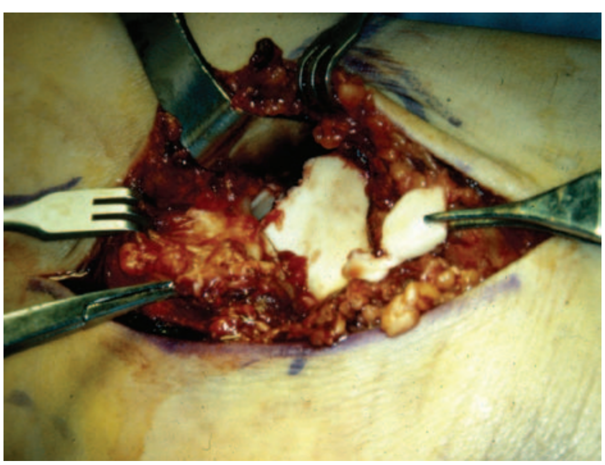

Figure 2C. Excision of the osteochondral fracture.

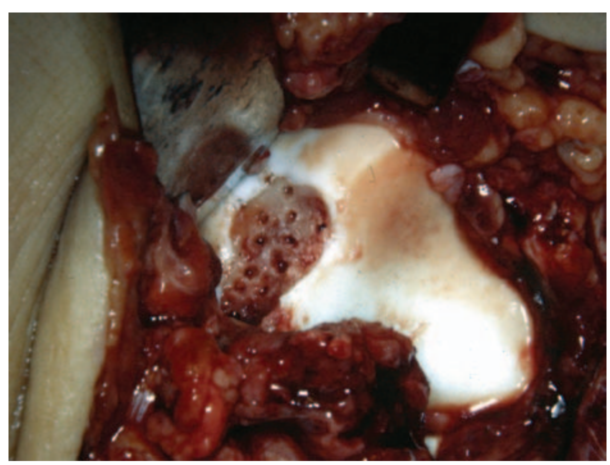

Figure 2D. Microfracture of the defect.

and the capsule-ligamentous disruption may result in fluid extravasation preventing joint distention.

The medial talar dome osteochondral fracture creates a more problematic surgical approach because of its more posterior location on the medial talar dome. There are three possible options: anteromedial (either arthrotomy or arthroscopic) approach, posteromedial (arthrotomy) approach, and medial malleolar osteotomy. Although acute medial talar dome fractures are possible, reflecting upon 34.5 years in practice, I believe them to be quite rare when associated with the ankle spraining mechanism as described by Berndt and Hardy. Most that I have seen have been lesions of a chronic nature. In fact, I have observed most acute medial talar dome lesions occur with ankle fractures and are located on the more anterior portion of the medial talar dome. The previously-mentioned surgical approaches are equally applicable in either acute or chronic lesions. A useful way to decide upon the appropriate surgical approach is to evaluate the lateral radiograph and attempt to decide how large the fracture fragment is and the relative anterior or posterior location. Sometimes a forced dorsiflexion or plantarflexion lateral radiograph is helpful. However,

Figure 3A. Mortise view of an acute lateral talar dome osteochondral fracture.

Figure 3B. Lateral view.

Figure 3C. Computed tomography scan demonstrating displacement and comminution of the fragment.

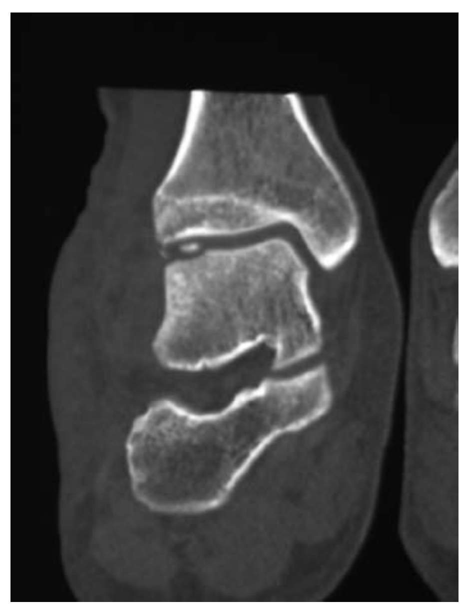

Figure 3D. Computed tomography scan.

attempting to manipulate the ankle in an acute injury may not be feasible and this may need to be done once the patient is under anesthesia. If the fragment comes even with or slightly behind the anterior tibial lip, it can be reached from an anteromedial arthrotomy.

Additional exposure can be accomplished by performing a notch-plasty or grooving procedure at the medial bend of the tibia (Figure 5). This can also be done arthroscopically. This will allow for more posterior visualization and space for instrumentation to remove the fragment. The use

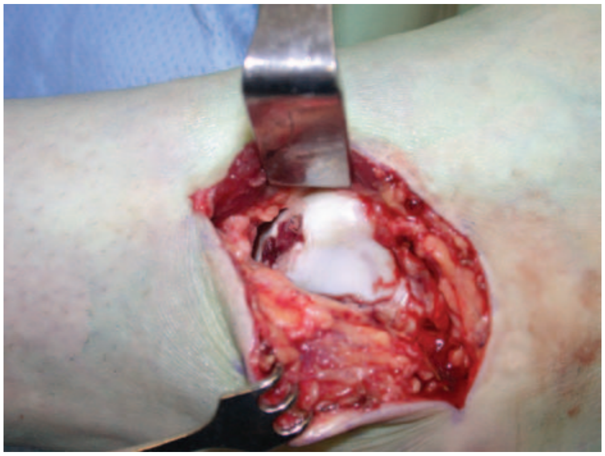

Figure 3E. Fracture site.

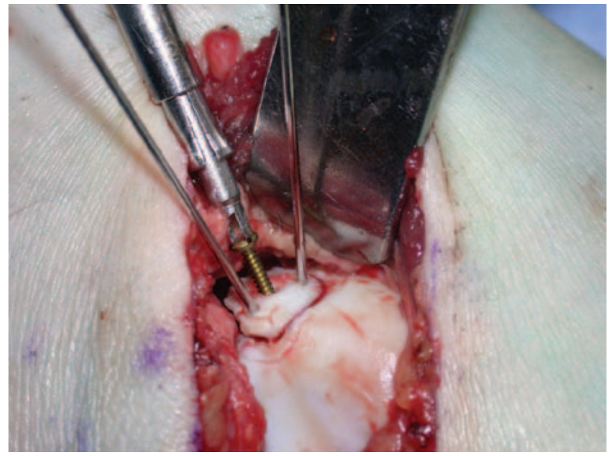

Figure 3F. Fragment is reduced, provisionally stabilized, and fixated with a mini-fragment cortical screw.

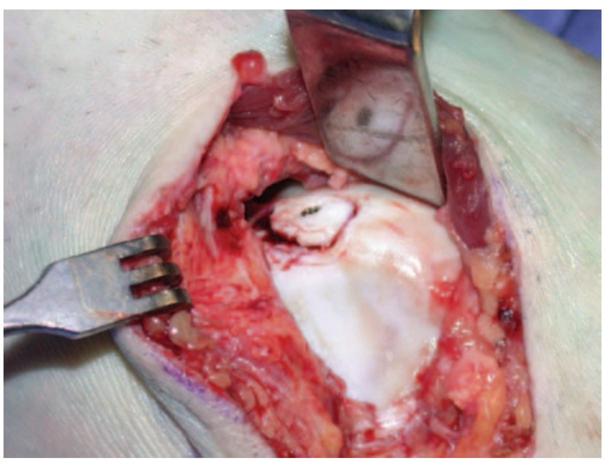

Figure 3G. The fracture anatomically reduced.

Figure 3H. Intra-operative radiograph demonstrating fracture reduction and good position of the screw.

Figure 4A. Mortise view of an acute stage IV lateral talar dome fracture.

Figure 4B. Lateral view.

Figure 4C. Computed tomography scan reveals the fracture.

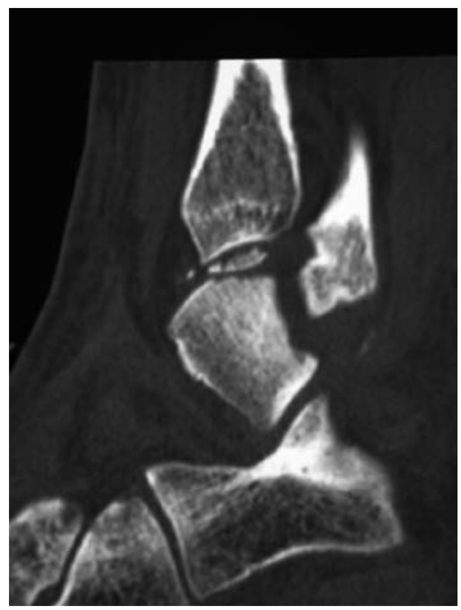

Figure 4D. Computed tomography reveals the fracture. Note that the fragment is upside down. The curved dorsal surface is facing inferiorly into the defect.

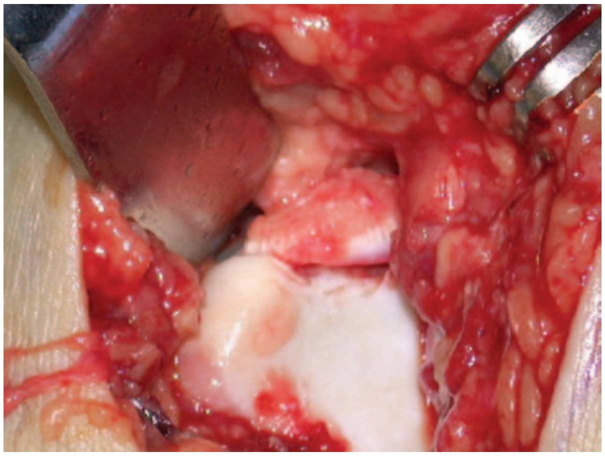

Figure 4E. Inverted osteochondral fracture.

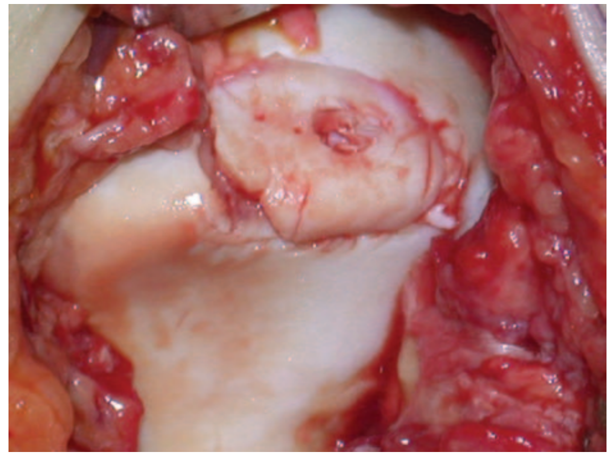

Figure 4F. A well-reduced osteochondral fracture fixated with an absorbable screw.

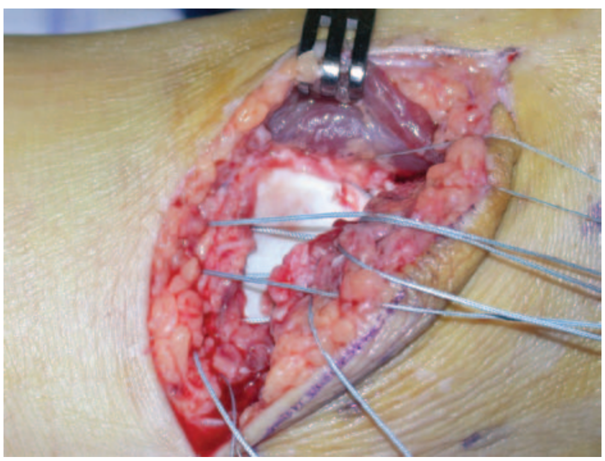

Figure 4G. Primary repair of the fibular collateral ligaments.

Figure 4H. Mortise view of the reduction.

of a noninvasive distractor can also increase access. If the fragment is more posteriorly located, then a posteromedial arthrotomy can be employed (Figure 6). An anteromedial or posteromedial approach can be successful for fragment excision and micro-fracture. However, if the fragment requires ORIF, then a medial malleolar osteotomy will normally be required. However, this is a rare occurrence in an acute lesion and more commonly utilized in chronic lesions. The management of chronic osteochondral fractures is beyond the scope of this article but includes fragment excision and micro-fracture, retrograde trans-talar drilling, mosiacplasty, and juvenile cartilage cells (1, 3-8).

The presence of osteochondral damage to the talus during ankle fractures is well known. Ferkel and colleagues

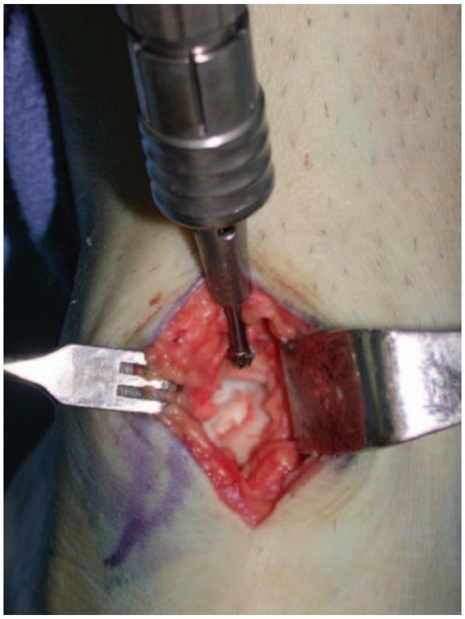

Figure 5. Anteromedial approach for a medial talar dome fracture with notch-plasty.

Figure 6A. Anterior-posterior radiograph demonstrating acute medial talar dome fracture fragments.

Figure 6B. Computed tomography scan.

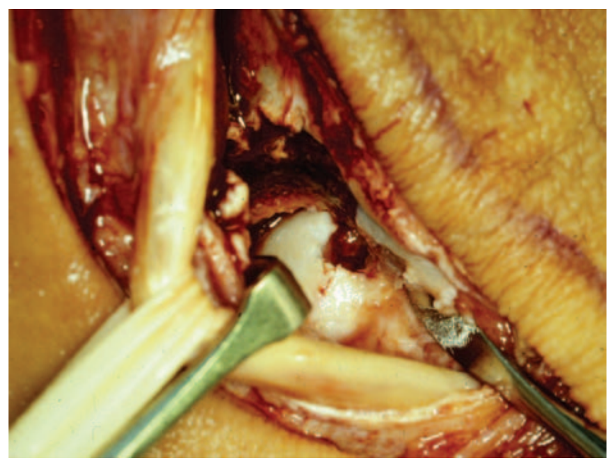

Figure 6C. Posteromedial approach revealing fracture defect after excision.

reported that up to 80% of ankle fractures have chondral or osteochondral damage (9). The ankle joint can be evaluated for osteochondral damage either by arthrotomy when the fracture is being exposed or by using the arthroscope through traditional portals or the open incision. Treatment may be just documenting the damage because it is excoriations/impactions of the articular surface. This may aid in predicting long term outcome. If there are chondral or osteochondral fragments, they may be excised with or without micro-fracture (Figure 7). Large osteochondral fragments can undergo ORIF but this is a rare event. I have had occasions where large chondral fragments have been avulsed off the medial talar dome. These were reduced and fixated with absorbable pins if possible (Figure 8).

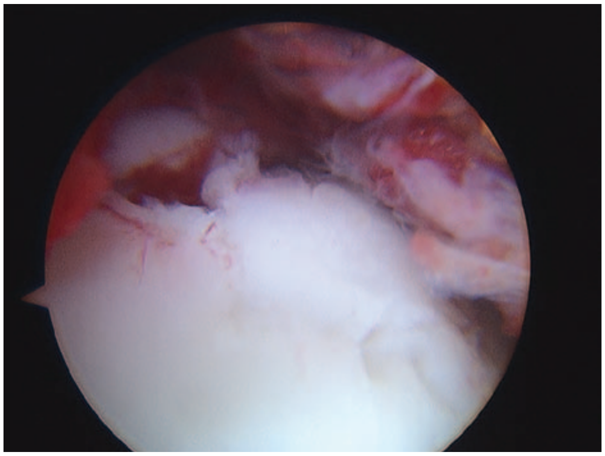

Figure 7. Arthroscopic photograph of acute medial talar dome damage caused by an ankle fracture.

Figure 8A. Radiograph of closed fracture dislocation of the ankle.

Figure 8B. Closed fracture dislocation.

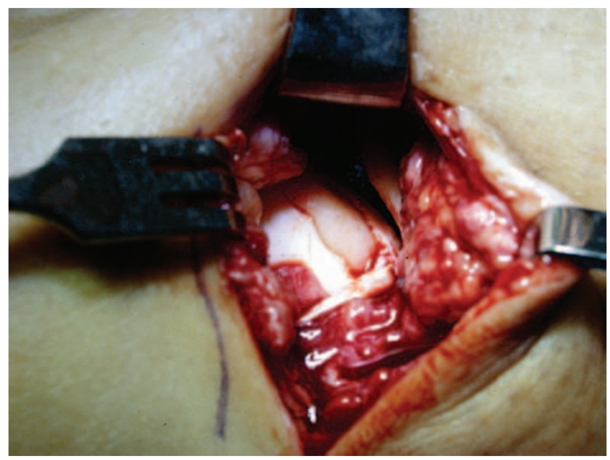

Figure 8C. Avulsion defect to the cartilage on the medial talar dome.

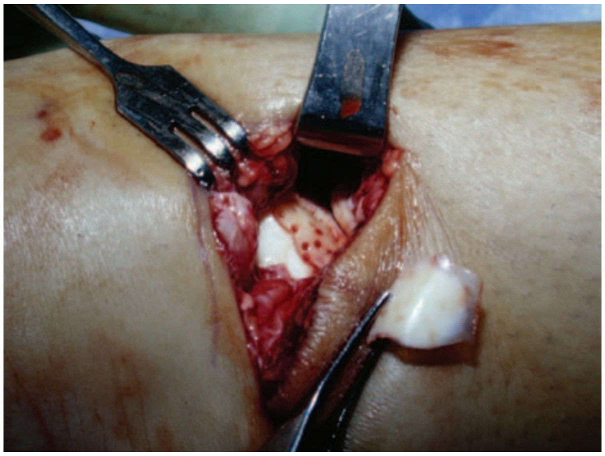

Figure 8D. Fragment is recovered.

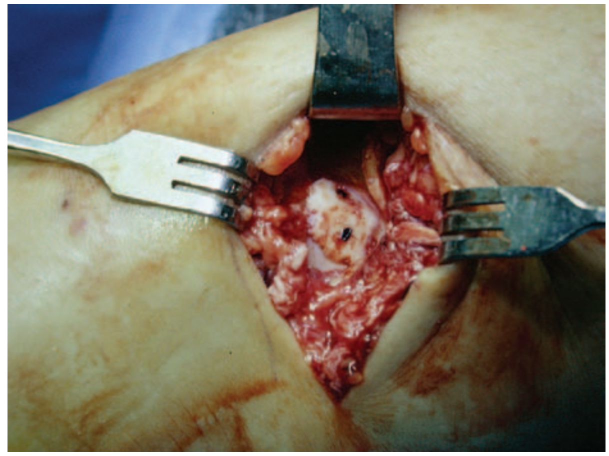

Figure 8E. Fragment reduced and fixated with absorbable Kirschner wires.

Figure 8F. Mortise view of open reduction internal fixation demonstrating an anatomic reduction.

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