CHAPTER 8

CHRONIC ANKLE JOINT PAIN: Subchondral Bone Cyst A Case History

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Chronic ankle joint pain can be a particularly challenging and sometimes perplexing problem, especially in patients who are avid athletes. Achieving solutions to such an enigma requires a thorough diagnostic work-up and a carefully designed treatment plan, often with a measure of creativity utilizing available technology.

CASE HISTORY

A 45-year-old podiatrist presented with chronic, yet intermittent left ankle pain that he had been experiencing for the previous 10 years. He was frustrated by its lack of response to treatment. In addition to training for and running in marathon races, he enjoyed a variety of other activities including rock climbing, bicycling, kayaking, and hiking. There was no known specific injury to the left ankle, but he did relate landing hard on his foot at times in the past when jumping down from ledge to ledge while rock climbing.

The ankle pain, described as both a deep ache and at times as a sharp jolt from within the joint, had worsened over the past three years to the point where the doctor could no longer pursue weight-bearing activities. Even standing in surgery was becoming intolerable, particularly when he would stand and rotate his torso with his foot remaining in a fixed position.

The podiatrist-patient had not noticed any joint swelling and could not tolerate ankle braces, compression ankle socks, or other supportive devices. The pain was relieved with rest and would extend on after pursuing weight bearing activities. Nonsteroidal anti-inflammatories provided mild relief, but were not particularly helpful. Intra-articular injections of steroids and local anesthetics provided immediate and almost total relief extending up to two weeks, followed by a return of pain. He had also tried three different types of orthotics because he was also plagued by a chronic cuboid syndrome. The orthotics did not help the ankle pain or the foot problem. Over the previous two years, two anterior approach arthroscopic ankle surgeries had been performed: one by a local orthopedic surgeon, and a second procedure by an experienced podiatrist with the assistance of a Holmium-YAG Laser. The joint surfaces were reported as clear with only some mild fibrillar synovitis. Since the last surgery the patient also described pain in the anteromedial ankle gutter area, mostly anteromedially. This had also become worse over the past year.

Physical examination revealed normal neurovascular status. There were two small scars on the anterior side of the left ankle. The medial scar was tender with a palpable deep, tender, movable nodule at the joint line. Range of motion of the ankle was pain-free without any clicking or crepitance, but with some restricted dorsiflexion. Tenderness was noted upon deep palpation of the posterior lateral and posterior medial ankle joint at the confluence of the posterior ankle and subtalar joints. The subtalar joint had a pain-free range of motion and there was no tenderness noted in the sinus tarsi. At mid stance, there was a moderate amount of pronation which appeared to be maximum for his range of motion. Unfortunately, the graphite orthotics being utilized failed to bring his feet to a neutral position.

The standard view radiographs showed no articular or peri-articular defects (Figs. 1A, 1B). Both the CT and MRI scans demonstrated a fluid-filled bone cyst 13 mm x 7 mm in diameter. The cyst was located in the subchondral tibial plafond, situated 1 cm from the posterior margin of the tibia and 2.5 cm from the external surface of the medial malleolus, and 1.5 cm from the lateral border of the lower tibia (Figs. 2-4).

The CT scan showed the lesion more clearly, and indicated a possible posterior extension. A contrast medium CT scan was also performed. The contrast material did not seem to penetrate the ankle joint, ruling out articular communication and joint fluid pistoning (Figs. 5, 6).

A diagnosis of subchondral intra-osseous cyst was proposed as a source of this chronic ankle pain. Since conservative measures had been

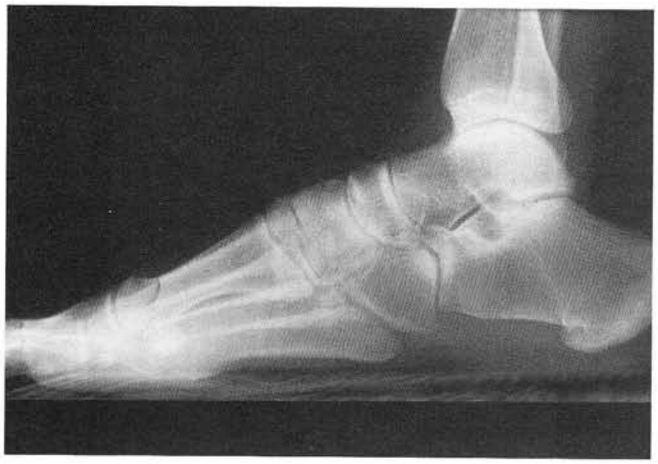

Figure 1A. Lateral x-ray view of the ankle joint.

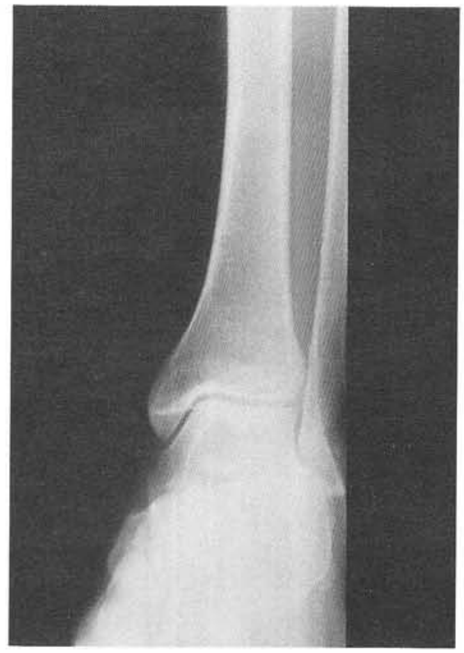

Figure 1B. Mortise x-ray view of the ankle joint.

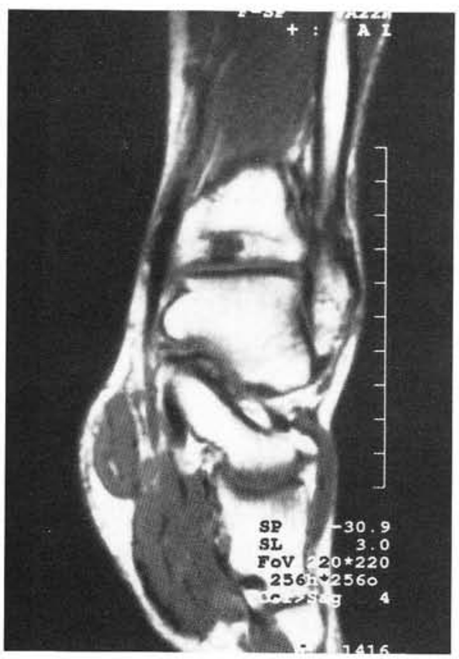

Figure 2. T1-weighted image of the MRI scan, coronal slice.

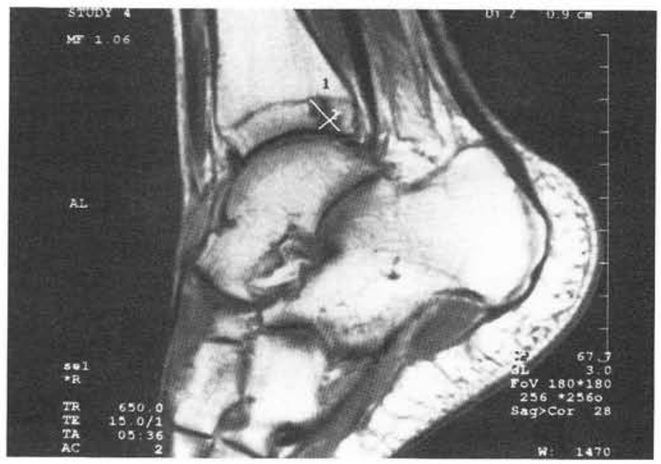

Figure 3. T2-weighted image of MRI scan, sagittal slice with measuring markers.

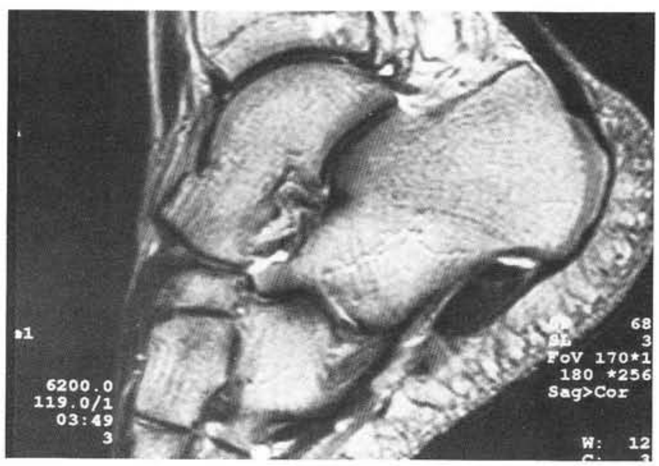

Figure 4. T2-weighted image of the MRI scan showing cyst to be fluid filled.

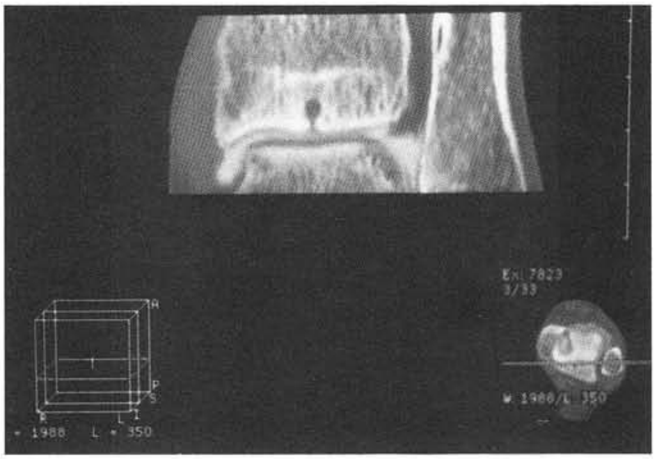

Figure 5. CT arthrogram of the left ankle, AP view.

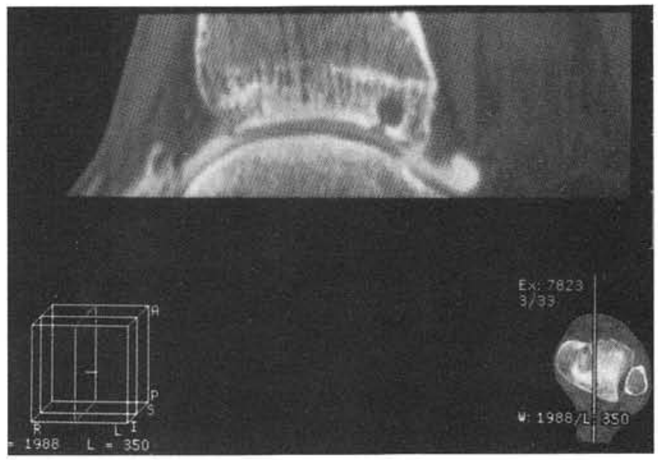

Figure 6. CT arthrogram of the left ankle, lateral view. Notice the contrast does not enter the bone cyst.

unsuccessful, a surgical plan was devised. Consultation was sought from two experienced ankle arthroscopists. It was determined that an arthroscopic approach to this lesion would be impossible without significant risk of damage to the joint and/or instrumentation. Access via a medial malleolar osteotomy was declined due to the additional morbidity risk and the articular invasion necessary to access the cyst. The goal was to keep the cartilaginous surface intact.

Since the cyst was not visible on x-ray, fluoroscopy could not be used for direct visualization of the cyst. However, it was felt the location could be accurately determined using the measurements from the CT and MRI scans. Therefore, a plan was devised to angulate a guide pin and cannulate a drill bit across the tibia to access the cyst with Fluoroscan-guided assistance, then curette and pack the area with bone graft (Figs. 7-9).

Execution of the surgical procedure took place through a 3 cm longitudinal incision situated between 7 cm and 10 cm above the tip of the medial malleolus on the medial leg. Once the periosteum was reflected, a 0.045" K-wire was used to penetrate to the exact calculated position of the bone cyst using the Fluoroscan for guided assistance. Once this position was accurately reached, a 4.0 mm cannulated drill bit was placed over the pin and drilled down to the level of the cyst with care being taken not to enter the ankle joint. The length of the hole was a little more than 4 cm. A buck bone curette was then inserted and used to remove the cyst. The cyst fragments were sent for pathologic analysis which eventually confirmed that the specimen was "consistent with osteochondral bone cyst."

At that point, liberal irrigation was used to flush out the drill hole which was then packed with autogenous bone graft particles from the drilling. The length of the drill hole was then filled with a custom fashioned dowel allogenic bone graft from the Musculoskeletal Transplant Foundation (Edison, New Jersey). It was fashioned into a peg to fit snugly into the hole. The periosteum was sutured and the wound was closed in layers.

A second surgical procedure involved excising the anteromedial ankle scar and entering the anteromedial ankle joint for an arthroplasty technique. The tissue was quite thick and scarified and the dissection carried down to the joint capsule which was then penetrated. Upon opening the joint capsule, there was a flap of scar tissue noticed to be irritating the shoulder of the talus. It was approximately .5 cm long and 1 cm wide. This flap was removed with sharp instrumentation, with care being taken not to damage the cartilaginous surface of the joint. The joint was further inspected and there was no synovitis noted and the cartilage was intact. After liberal irrigation, the ankle joint capsule was closed and the remaining tissues closed in layers. Early range of motion was started, as well as weight bearing after the first three post-operative days. Although the symptoms persisted for several months, at six months, the podiatrist-patient was pain-free and was able to compete in a 150 mile bicycle race without discomfort. This case is a good example of utilizing technology in conjunction with a sound knowledge of anatomy to solve a challenging clinical problem to the benefit of the frustrated patient.

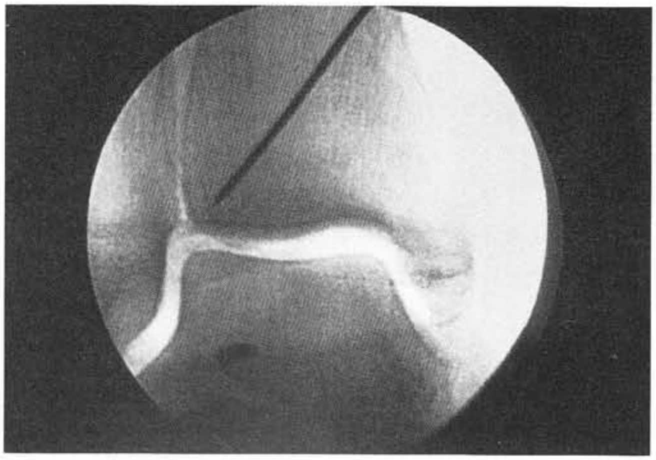

Figure 7. K-wire guided with Fluoroscan assistance.

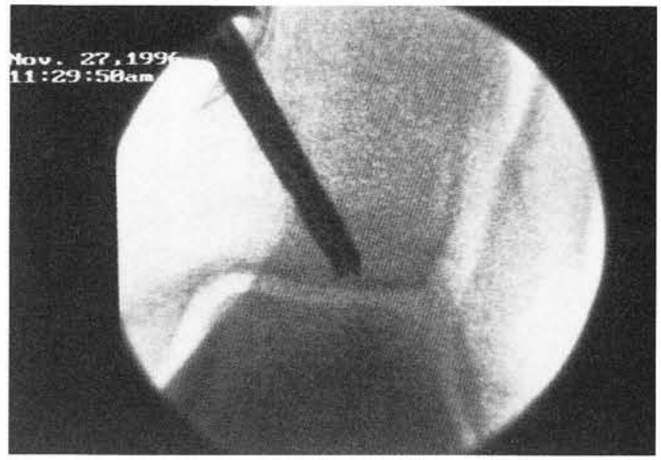

Figure 8. Cannulated 4.0 mm drill bit.

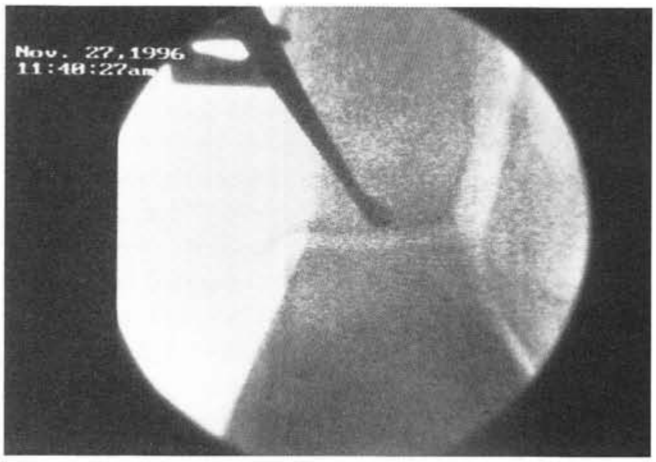

Figure 9. Curette used to extract the cyst.

DISCUSSION

Subchondral bone cysts fall within the classification of bone tumors and tumor-like lesions.[1] Often termed juxta-articular bone cysts, they are defined as "benign cystic and often multi-loculated lesions made up of fibrous tissue, with extensive mucoid changes located in the subchondral bone adjacent to a joint. Radiographically, each appears as a well-defined osteolytic lesion with a surrounding area of sclerosis. It has been described as a synovial cyst, but it lacks a synovial lining."[2] The cysts are usually solitary, but may be multilocular, and commonly develop in the epiphyseal or metaphyseal areas of bone adjacent to joints. Generally, they have a whitish or bluish lining consisting of parallel bundles of collagen. The fibrocytes lying along the inner wall of the cavity sometimes form an incomplete lining of flattened, synovial-like cells. These make for a smooth wall within which the cyst contains a thick gelatinous mucoid fluid.[3-5] They are likely to communicate with the joint through the articular surface in up to 40% of the cases, and therefore may be filled with synovial fluid.

Many theories have been proposed to describe the genesis of these lesions.[6] The early theories of "synovial fluid intrusion," either as a primary event from increased intra-articular pressure, or as a secondary event during the healing process when necrotic subchondral bone is removed, is more applicable to the subchondral bone cyst associated with arthritic disease or trauma. The role of trauma and compressive forces has been postulated, but the exact association remains unclear. In a recent survey of intra-osseous ganglia (another name for subchondral bone cyst), out of 213 lesions, Murff and Ashry found the majority located in the distal tibia.[7]

Although cystic bone lesions may be asymptomatic, they commonly cause intermittent pain aggravated by increased activity. Joint movement by itself does not necessarily cause pain. The discomfort is thought to be caused by an increased intra-lesional pressure from the accumulation of fluid. However, on rare occasions, the pain may develop from fracture through the subchondral bone. These lesions tend to weaken the surrounding bone. If there is communication between the cyst and the joint, then the synovial fluid may move back-and-forth, pistoning between the two cavities. Occasionally, pain precedes the radiographic appearance of the lesion. More over, subchondral bone cysts have been reported to occur preceding the subsequent diagnosis of inflammatory or degenerative arthritis. Such a cyst is often visualized on standard x-rays, well-defined in bone with a sclerotic rim around a radiolucency. However, it is better delineated using computed tomography (CT) which also helps determine if it communicates with the joint. To better determine the soft tissue components, as well as the nature of the fluid within the cyst, magnetic resonance imaging (MRI) is a more precise diagnostic tool. It is especially helpful in analyzing the contents of the cyst.[8]

The subchondral bone cyst should be differentiated from aneurysmal bone cyst, giant cell tumor, chondromyxoid fibroma, cartilage tumor, unicameral bone cysts, Brodie's abscess, osteomyelitis, and pigmented villonodular synovitis. It is not erosive; on rare occasions, the lesions of tuberculosis in bone may resemble the osteochondral bone cyst.

Surgical treatment, once conservative measures have been exhausted, usually involves accessing the cyst and curetting it. Every attempt should be made to preserve the cartilaginous surface. However, if it is already destroyed then it behooves the surgeon to simply curette the cyst out and leave an open cavity within the joint which will fill in with fibrous tissue.[9] Another way to access the lesion is through the bone near the lesion. This allows use of a curette to extract the lesion and, if possible, pack it with bone graft. The success rate of curettage and packing is very high, with only a 7% recurrence rate reported.

Since these lesions often occur in very odd locations, the surgeon must be both creative and resourceful. However, treatment is generally very rewarding with satisfactory results. The use of low radiation Fluoroscan imaging to accurately guide instrumentation to the site has been extremely beneficial.[10] This is an example of applying current technology to a challenging surgical problem.

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