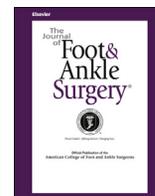




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Tips, Quips, and Pearls

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Distraction Arthroplasty With Arthroscopic Microfracture in a Patient With Rheumatoid Arthritis of the Ankle Joint



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ABSTRACT

We treated a 39-year-old female who had experienced destruction of her ankle joint owing to rheumatoid arthritis. This relatively young patient wished to avoid ankle fusion and joint replacement. Therefore, distraction arthroplasty with arthroscopic microfracture was performed to improve her symptoms and preserve motion. A microfracture procedure specifically for cartilage defects of the tibial plafond and talar dome was performed with the arthroscope, after which a hinged external fixator was applied to distract the ankle joint. The ankle joint space was enlarged by the external device and joint movement allowed. After 3 months, removal of the external device and repeat arthroscopy revealed newly formed fibrocartilage on the surfaces of both the tibia and the talus. At 2 years after the surgery, a radiograph showed that the joint space enlargement of the ankle had been maintained. The American Orthopaedic Foot and Ankle Society score improved from 37 points preoperatively to 82 points at 2 years postoperatively. Our findings suggest that good clinical results can be achieved with distraction arthroplasty and arthroscopic microfracture in a relatively young patient with rheumatoid arthritis.

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Rheumatoid arthritis (RA) is characterized by systemic chronic inflammation, followed by subsequent joint destruction. Synovial hyperplasia and pannus formation occur from inflammatory cytokines that include tumor necrosis factor- α and interleukin-6, which invade the articular cartilage and bone by activation of osteoclasts and secretion of degrading enzymes (1). Currently, with RA very well controlled systemically by several agents, including biologic reagents such as tumor necrosis factor- α or interleukin-6 blockers, the most important factor is preservation of the arthritic joint for activities of daily living (2,3). Arthrodesis or total ankle arthroplasty is a common treatment for the rheumatic ankle (4). Arthrodesis has been established for the relief of pain and improvement of activities of daily living. However, this procedure will have a detrimental effect on the range of motion of the talocrural joint (ideally, it will eliminate this motion altogether) and can be complicated by bony union failure and

arthritic changes in the adjacent subtalar joints after ankle fusion (5,6). Another treatment of end-stage rheumatism of the ankle is total ankle replacement. Also, although the outcomes of total ankle replacement have improved, the risk of infection, prosthetic wear, and prosthetic loosening from osteoporotic bone in patients with RA remains high (7,8). For young patients with RA, alternative treatments that aim to preserve the joint should be considered.

For the arthritic ankle, especially a post-traumatic osteoarthritic joint, the effectiveness of distraction arthroplasty has been appreciated. Distraction arthroplasty is commonly performed on several joints, including the hips, knees, and ankles, to preserve the joint space and decrease the weightbearing load by distraction using an external fixator (9–14). van Valburg et al (14) demonstrated successful results using Ilizarov joint distraction in 11 patients with advanced post-traumatic osteoarthritis (OA). Bone marrow-stimulating techniques have also been commonly used for articular cartilage repair, and the combination of this procedure with articulated joint distraction could possibly improve articular cartilage repair. Deie et al (11) reported good clinical outcomes for knee OA using the articulated distraction arthroplasty device combined with subchondral drilling. The concept underlying this is that distraction will allow continuous joint movement, which is essential for cartilage regeneration, and that

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Fig. 1. Preoperative radiographs of the ankle. Anteroposterior (A) and lateral (B) radiographs showing loss of joint space in the ankle joint.

it reduces overloading, protecting fibrocartilage regeneration. In previous reports, distraction arthroplasty for the ankle joint had overall good results; however, these reports included fixed and hinged external fixators (9,10,12–17). Saltzman et al (12) showed that the result of motion distraction arthroplasty was better than that of fixed distraction for OA of the ankle. Thus, several reports have demonstrated that distraction arthroplasty for advanced OA can have beneficial effects. However, the effect of distraction arthroplasty on inflamed joints such as those affected by RA remains unclear. We hypothesized that distraction arthroplasty, combined with the bone marrow-stimulating effect of microfracture, for patients with RA could be a useful treatment. In the present report, we describe the results of this technique in an adult female with RA.

Case Report

A 39-year-old Japanese female with a 5-year history of RA had been treated for severe erosive arthritis with 12 mg/wk of methotrexate. She complained of left ankle pain and left elbow pain that was especially notable when she experienced left ankle pain. The left

ankle was swollen, with local heat and limited range of motion (passive dorsiflexion of only 10° and plantar flexion of 25°). A plain radiograph in the standing position revealed diminished joint space of the tibiotalar and talocalcaneal interfaces, with the narrowing classified as Larsen grade 4 (Fig. 1). Magnetic resonance imaging scans showed articular cartilage loss in the tibiotalar joint (Fig. 2). The American Orthopaedic Foot and Ankle Society hindfoot-ankle scale score was 37 points (18,19). She was forced to apply a patella tendon weightbearing cast and use crutches when walking because of severe ankle pain. She was advised to undergo ankle arthrodesis at another hospital, but she declined because of the associated loss of all ankle range of motion. She also declined total ankle replacement, because of concerns associated with the potential complications. Therefore, to ameliorate her ankle pain while preserving, or even improving, her range of motion, we chose to perform distraction arthroplasty with microfracture on her left ankle.

Before surgery, the patient's systemic methotrexate use was stopped for 2 weeks, and corticosteroid supplementation was not used during that period. A 1-g dose of cefazolin sodium hydrate as a prophylactic antibiotic was given intravenously before surgery; a total

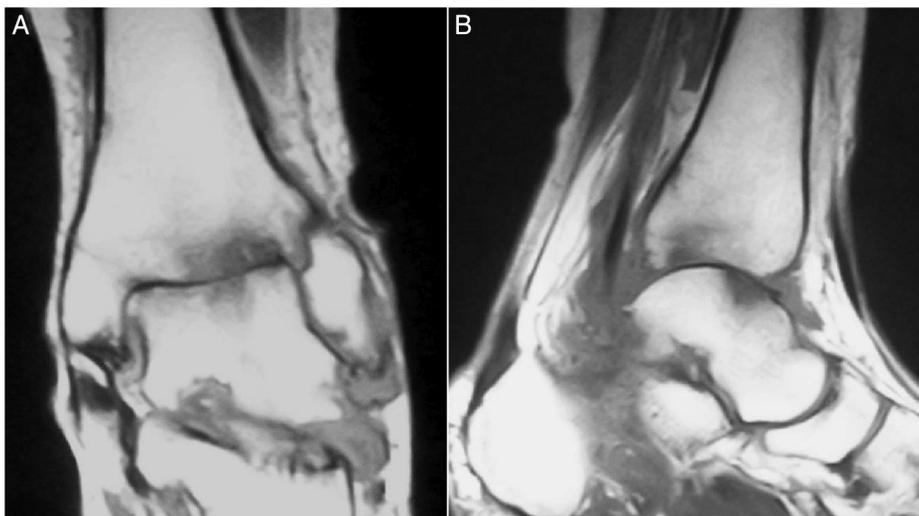


Fig. 2. Preoperative magnetic resonance imaging scan of the ankle. Coronal (A) and sagittal (B) magnetic resonance imaging scan revealing articular cartilage disappearance and a T₁-weighted low-intensity area in the subchondral bone of the talus and tibia, indicating the change in the subchondral bone structure associated with cartilage degeneration.

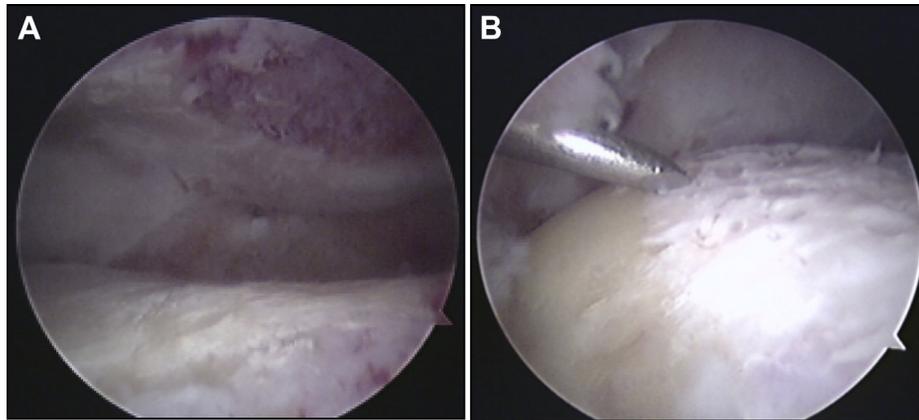


Fig. 3. (A) Arthroscopic findings showing the disappearance of articular cartilage and exposure of subchondral bone in the talus and plafond. (B) Microfracture performed on the talus and plafond.

of 5 g of cefazolin sodium hydrate was given for 48 hours postoperatively. With the patient under general anesthesia, she was placed in the supine position with tourniquet hemostasis about the thigh. Standard anterolateral and anteromedial portals were established under joint distraction using an ankle distractor (Smith & Nephew, Memphis, TN). A 2.7-mm, 30° oblique arthroscope was used. Inspection showed that the articular cartilage had almost disappeared from the talar dome and tibial plafond, and the subchondral bone was exposed (Fig. 3). Synovectomy was performed with a motorized shaver in an effort to eradicate gross synovitis, and the microfracture procedure was performed on the talar dome and plafond (Fig. 3). After blood flow from the subchondral bone through the microfracture site was confirmed, an external fixator was applied. Two pins were inserted into the talar neck and calcaneus under fluoroscopy, and 2 additional pins were inserted into the tibia. Next, an articulated external fixator (Orthofix XCaliber™ Articulated Ankle Fixator, Orthofix Corp, McKinney, TX), which allowed ankle movement, was

applied and distraction was applied across the joint (Fig. 4). The ankle joint space enlarged to 5 mm with distraction, and after the range of motion of the ankle joint was checked, the skin at the arthroscope portals was reapproximated. From the day after the external fixator was applied, motion exercise of the ankle joint was started. For the first 3 postoperative months, until the external fixator was removed, weightbearing was prohibited. At 3 months after surgery, the external fixator was removed, and repeat arthroscopy was performed. Newly formed fibrocartilaginous tissue was apparent on the surface of the talar dome and tibial plafond, and the subchondral bone was no longer exposed (Fig. 5). After removal of the fixator, weightbearing was permitted.

At 1.5 years postoperatively, the magnetic resonance imaging scans revealed that the surface of the talar dome and tibial plafond were covered with tissue (Fig. 6). At 2 years postoperatively, the American Orthopaedic Foot and Ankle Society score had improved from the preoperative value of 37 points to a postoperative score of 82 points. Moreover, dorsiflexion had increased to 15° and plantar flexion had increased to 30° postoperatively, and she could walk



Fig. 4. Radiographs after application of the external fixator. (A) Anteroposterior and (B) lateral radiographs showing that the external fixator caused joint space enlargement.

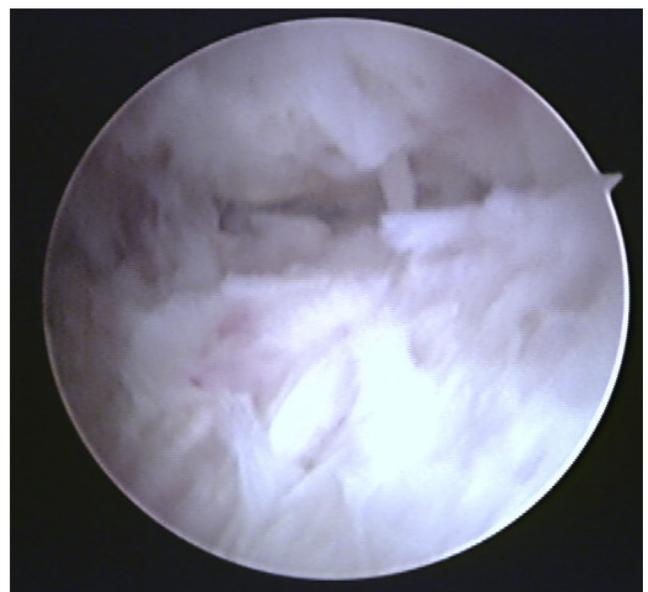


Fig. 5. Arthroscopic findings at report arthroscopy. At 3 months, the external fixator was removed and an arthroscopic examination performed. Newly formed fibrous tissue was apparent on the surface of the talar dome and plafond, and the subchondral bone was no longer exposed.



Fig. 6. Radiographs at 2 years postoperatively. (A) Anteroposterior and (B) lateral radiographs in the standing position showing joint space enlargement in the ankle joint.

smoothly without the use of an ankle-foot orthosis, crutches, or a cane. Furthermore, on the standing ankle radiograph, the ankle joint space remained evident (Fig. 7).

Discussion

Preservation of the joint against the destruction caused by RA is challenging. For badly damaged or destroyed ankles, arthrodesis or total ankle arthroplasty can be performed (4–8). Joint preservation

surgery for patients with RA should also consider the improvement of antirheumatic drugs (including biologics). Since van Valburg et al (14) demonstrated the efficacy of distraction arthroplasty on arthritic ankle joints, distraction arthroplasty has mainly been applied to post-traumatic OA ankle joints. Paley and Lamm (9) also demonstrated excellent results with articulated ankle distraction for the treatment of osteoarthritic ankles, and Tellisi et al (13) reported the effectiveness of distraction arthroplasty using a circular external fixator in 25 patients with ankle OA. This evidence supports the

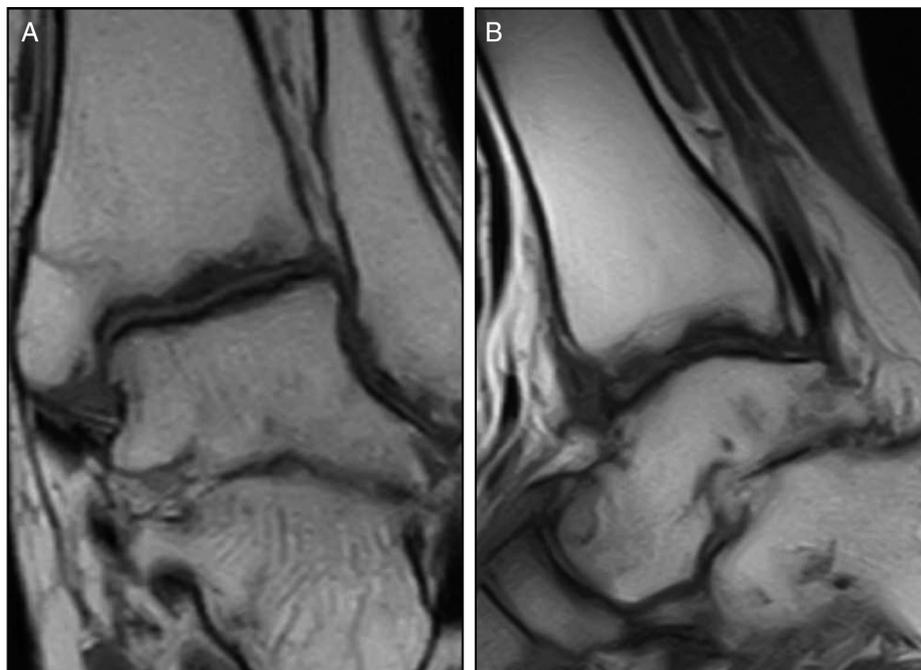


Fig. 7. Magnetic resonance imaging scans at 1.5 years postoperatively. (A) Coronal and (B) sagittal magnetic resonance imaging scans revealing that the surface of the talar dome and plafond are covered with newly formed tissue.

effectiveness of distraction arthroplasty for the osteoarthritic ankle joint. However, to the best of our knowledge, no previous reports have been published of distraction arthroplasty for the treatment of the ankle joint in patients with RA.

Kajiwarra et al (15) demonstrated hyaline cartilage regeneration in cartilage defects in the rabbit knee using a combination of an articulated distraction device and subchondral drilling. Another important aspect of their report was the discovery that the duration of 4 weeks for distraction was not sufficient for cartilage repair; however, they obtained good outcomes in cartilage repair with 8- and 12-week periods. In keeping with these results, Deie et al (11) demonstrated good results in 6 patients with knee OA within 9.3 (range 7 to 12) weeks using an articulated distraction device with the bone marrow stimulation technique. For distraction arthroplasty of the ankle, the duration of distraction in previous reports has ranged from about 12 to 17 weeks; however, these reports included motion and fixed distraction (9,10,16,17). Saltzman et al (12) reported a prospective randomized controlled trial comparing the outcomes of distraction arthroplasty using hinged or fixed external fixators in patients with advanced OA. In their protocol, the external fixation was removed at 85 to 95 days, and motion distraction showed good results after removal of the fixator. Understanding this evidence, we decided to continue the duration of fixation with the external fixator for 12 weeks in our patient with RA.

Distraction arthroplasty has several disadvantages for patients with RA. First, joint inflammatory cytokines have a harmful influence on cartilage repair (20,21). Second, loosening of the inserted pins could occur from osteoporosis (22) could predispose to pin tract infection and loss of stability. However, it is very likely that good disease control and management could curtail these potential complications.

The present case report had several limitations, similar to those of every case report. First, we reported a single case with intermediate-term follow-up data. With a single case, it is unclear whether this procedure will be effective for patients with RA and ankle pain and loss of the joint cartilage. Also, the possibility exists that longer follow-up data might show substantially different results. RA is a progressive disease; therefore, tight control with antirheumatoid drugs will be needed long term to prevent the joint destruction worsening. Finally, the outcome of this procedure was not compared with that of isolated bone marrow stimulation techniques or synovial debridement or any other treatment that has been reported to be effective. However, Kajiwarra et al (15) demonstrated that articulated joint distraction with subchondral drilling is effective for repairing an osteochondral defect in contrast to drilling alone in a rabbit model. Moreover, distraction arthroplasty enables enlargement of the joint space, which is expected to increase the range of motion by reduced joint contracture (11) and, theoretically, fibrocartilage formation. Distraction arthroplasty with the bone marrow stimulation technique probably has the advantage of preventing damage to the newly formed fibrocartilage. Finally, case reports will be influenced by the biases of the treating surgeon.

In conclusion, distraction arthroplasty with the use of an articulated external fixator, combined with microfracture to stimulate marrow cell transformation into cartilage-forming elements, has the potential to improve arthritic ankle joint symptoms in younger patients with RA whose disease activity is well controlled. Although

distraction arthroplasty for arthritic ankle joints in patients with RA is a challenging procedure, preservation of the ankle joint of younger patients with RA should be considered as an alternative to total ankle arthroplasty or arthrodesis.

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