

# Ankle Arthrodiatasis Treatment of Talar Avascular Necrosis Secondary Non-displaced Talar Body Fracture

Kelsey Millonig, DPM, MPH<sup>1</sup>; Stephanie Oexeman, DPM<sup>1</sup>; Byron Hutchinson, DPM FACFAS<sup>1</sup>

Franciscan Foot & Ankle Institute, Federal Way, WA

## Statement of Purpose

Fractures of the talus present with inherent complications to recovery including avascular necrosis (AVN) which is challenging to treat. No standard of care exists for treatment of avascular necrosis of the talus, however various treatment modalities have been presented in the literature. Joint destructive procedures are limited by functionality and often require filling large bone defects making it impractical for many patients. This case study presents a novel surgical approach for treatment of talar AVN with talar core depression and ankle arthrodiatasis external fixation.

## Literature Review

Poor outcomes remain common amongst treatment of avascular necrosis of the talus with no consensus for treatment guidelines.<sup>1</sup> Gross et al completed a systematic review of treatment options including non-weightbearing, patellar tendon brace, vascularized and non-vascularized bone grafts, core decompression, hindfoot fusion, and total talar prosthesis.<sup>1</sup> Core decompression has demonstrated mixed results without prognostic factors suggestive of clinical outcomes.<sup>2</sup> However, it has been reported as successful in both early and late stages of avascular necrosis. Conversely, core decompression has been reported with 11% of patients requiring a fusion.<sup>3,4</sup> Similarly, various arthrodesis procedures have been reported with high rates of delayed, nonunion, or re-operation.<sup>1</sup> Once conservative treatment has been exhausted, the treatment for avascular necrosis of the talus becomes very challenging. Ankle arthrodiatasis has been reported as a treatment for osteoarthritis with the aim of increasing type II cartilage.<sup>5</sup> Cadaveric studies have demonstrated a necessary 5.8mm of distraction to ensure no contact during full weightbearing.<sup>6</sup> Hinged compared to static distraction has been contradicted in the literature, however Nguyen et al study demonstrated more preservation of the native ankle joint at five years with static fixation.<sup>7,8</sup> Ankle arthrodiatasis with combined procedures has not been studied in the treatment of talar avascular necrosis, this case study demonstrates a novel approach.

## References

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## Case Study

A case is presented of a 21 year old female with unremarkable medical history who experienced immediate onset ankle pain after stepping out of a car. A nondisplaced talar body fracture was diagnosed two months post injury. Conservative treatment failed including periods of non-weightbearing and bone stimulator use. All lab work was negative for seronegative arthropathies or contributing underlying medical conditions. The patient was diagnosed with osteonecrosis twelve months status post injury (Figure 1). The patient underwent talar open reduction internal fixation fifteen months post injury via posterolateral approach with the goal of the procedure to disrupt the sclerosis and increase blood flow to the talar body. At eighteen months post injury the patient underwent an ankle scope and first tarsometatarsal arthrodesis to address medial column instability and synovitis (Figure 2). At 26 month post injury the patient continued to have inability to bear weight, pain surrounding the ankle joint, and significant loss of range of motion of the ankle joint with continued significant talar avascular necrosis as demonstrated by MRI, CT, SPEC-CT, and bone scan (Figure 3). The patient underwent a third surgical procedure with talar hardware removal, talar dome core decompression with bone marrow aspirate, and ankle arthrodiatasis with external fixation application (Figure 4). External fixation was removed following three months of ankle arthrodiatasis (Figure 5). The patient subsequently underwent synthetic joint fluid injection, physical therapy, and use of a dynamic orthosis brace with complete resolution of symptoms and release to full activity in the brace. At 44 months post injury and 24 months status post ankle arthrodiatasis, a CT has demonstrated minimal talar collapse as compared to previous CT from anterior to posterior with demonstration of remnant osteonecrosis and cyst formation (Figure 6). The patient is asymptomatic with return to full activity at 24 months postoperative demonstrating the use of core decompression with ankle arthrodiatasis as a viable treatment course of talar avascular necrosis and ankle arthrofibrosis in young active patients to delay joint destructive procedures.

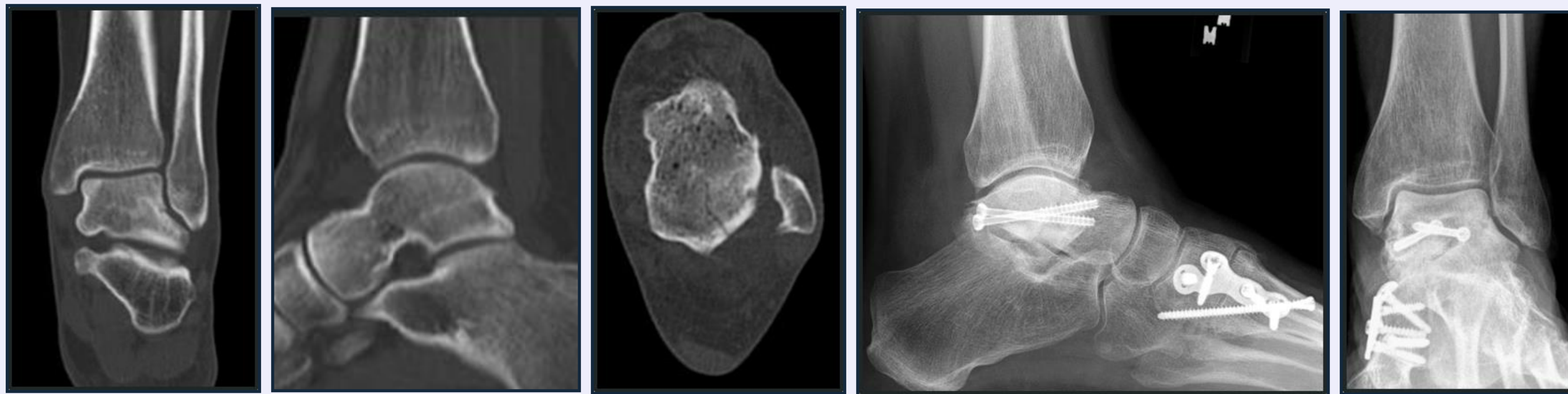


Figure 1: CT scan nondisplaced talar fracture 12 month post injury

Figure 2: X-ray status post talar ORIF, first tarsometatarsal arthrodesis, 24 mo post injury

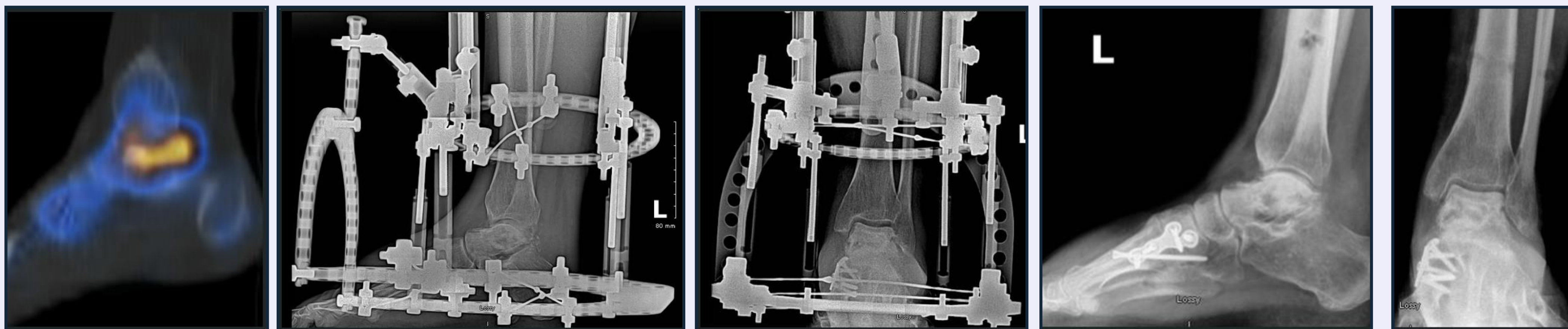


Figure 3: SPECT- CT

Figure 4: X-ray status post ankle atrocities external fixation application

Figure 5: X-ray status post external fixation removal

## Surgical Technique

Attention was directed to the proximal medial face of the tibia where 60mL of bone marrow aspirate (BMA) was obtained. Attention was then directed to the lateral posterior ankle in the region of the previous posterolateral incision and the previously implanted 4.0mm talar screws were removed. A 3.5 drill was passed down the course of the screws and BMA combined with demineralized bone matrix (DBM) was inserted down the canals of the previously removed hardware. An incision was made over the anterolateral ankle which was noted to have significant synovial hypertrophy and well adhered to the talus with extensive arthrofibrosis requiring release with cobb elevator to allow distraction of the ankle joint. A 3.5 drill bit was used to drill 2-3 cores from the central talar body which was then filled with BMA and DBM. A static external fixator was applied with two tibial ring blocks and a foot plate. Acute ankle joint distraction of 6mm was obtained intraoperatively.



Figure 6: CT and X-ray 50 month post injury, 24 month status post ankle arthrodiatasis

## Analysis & Discussion

This study presents an extensive treatment course of a young patient with talar avascular necrosis and ankle arthrofibrosis as diagnosed intraoperatively. Due to lack of consensus for treatment of talar avascular necrosis in the literature, the patient's young age, and her desire to remain active; surgical decision making was difficult. Extensive discussion was had with the patient regarding options of arthrodesis which the patient elected to decline until exhaustive joint-sparing treatment options were completed. The use of combined talar core decompression with ankle arthrodiatasis has not been reported in the literature. This case study demonstrates this as a viable option for treatment of talar avascular necrosis with ankle arthrofibrosis. The goal of this procedure was to decrease pain, improve function including ankle range of motion, and delay further collapse. This technique allowed for asymptomatic full return to activity in a brace at two year follow-up.