

Medial Column Arthrodesis with Autogenous Bone Graft in a Diabetic Charcot Patient Complicated by Joint Sepsis

Mitchell Flippin DPM, Lawrence Fallat DPM, FACFAS
Beaumont Hospital – Wayne, MI

Statement of Purpose

Diabetic charcot neuroarthropathy can be a severely debilitating disease, which can lead to a non-plantigrade foot, ulcerations, infections, and possibly subsequent limb loss. Charcot in the presence of osteomyelitis with segmental bone loss can be challenging, and technically difficult to successfully gain independent ambulation and functional outcome. This case study presents our techniques and method for treating this complex condition to provide lower limb stability and optimal outcomes.

Literature Review

Charcot osteoarthropathy, a condition that results in the destruction of single or multiple joints leading to permanent joint deformity, is reported to affect only 0.2% of the diabetic population (1). Charcot has also been reported in connection with multiple other medical disorders associated with significant decrease or loss of pain sensation to the area (1). Patients typically present with significant localized edema, erythema, and warmth in the affected limb which is often misdiagnosed clinically. Early and accurate diagnosis of acute Charcot is of importance in the clinical management of this condition (2). White blood cell-labeled bone scan and MRI has been used by many physicians to differentiate Charcot from osteomyelitis (3). The accepted initial treatment protocol is complete offloading with total contact casting, and local wound care for any ulceration (4,5). Common surgical intervention would include midfoot fusion and is a salvage procedure that can prevent ulceration and infection, therefore preserving the limb (6). Fusion can be accomplished through internal fixation, external fixation, or a combination of both. One technique is beaming, which uses axial intramedullary large-diameter screws to realign the medial and lateral columns. (6). The beams behave like reinforcement rods and share the load with the bones, ligaments, and joints of the foot, thereby decreasing the sum of the bending forces on the bone through accepting axial forces of compression and tension sustained by the entire column (8).

Figure 1



Figure 1A: Pre-operative lateral view with bony defect within talus

Figure 1B: CT scan showing erosion of talus and navicular along with emphysema dorsally

Case Study

A 52-year-old Type 1 Diabetic male with a recent diagnosis of Charcot neuroarthropathy was undergoing surgical planning for medial column arthrodesis, when a pre-operative radiograph and CT scan (Figure 1) noted emphysema with possible osteomyelitis at the talonavicular joint and a septic ankle joint. Patient was immediately admitted and underwent incision and drainage, bone biopsy, with vancomycin antibiotic bead placement. All wound and surgical cultures were negative, with a pathological diagnosis of osteomyelitis from the bone specimen from the dorsal talar neck. The patient was discharged seven days post-op after a peripherally inserted central catheter was placed and then treated with long term intravenous ertapenem for six weeks. Three months later after the patient was medically stable, a definitive final reconstruction was undertaken. Due to the severe bone loss within the talar head and neck with Charcot deformity, a medial column arthrodesis was performed with autogenous calcaneal bone graft. An incision was made along the talonavicular joint and was deepened through subcutaneous tissue. A Capsular incision was then made and fibrotic scar tissue was noted filling the void within the talar head and neck. A 22 mm trephine was used to bore out the soft tissue and bony fragments from the defect (Figure 2). Next an incision was made overlying the lateral aspect of the calcaneus. The same 22 mm trephine was used to obtain a calcaneal autograph and then the void was filled with a ten mm evans wedge allograft. Both autograph and allograft were soaked in bone graft substitute. Two 7.0 mm cannulated screws were placed across the allograft in the calcaneus (Figure 3). The calcaneal autograft was placed within the deficit in the talar neck and head. Next an incision was made to visualize the distal aspect of the first metatarsal head, while a trephine was used to remove a plug of bone from the metatarsal head. A guide wire was driven down the first metatarsal and proximally anchored into the talus using fluoroscopy. A 7.0 mm beam was then inserted after drilling and the plug reinserted at the distal aspect of the metatarsal. Post-operatively the patient was placed in a well-padded below-knee fiberglass cast and was instructed to remain non-weight-bearing (Figure 4).

Figure 2

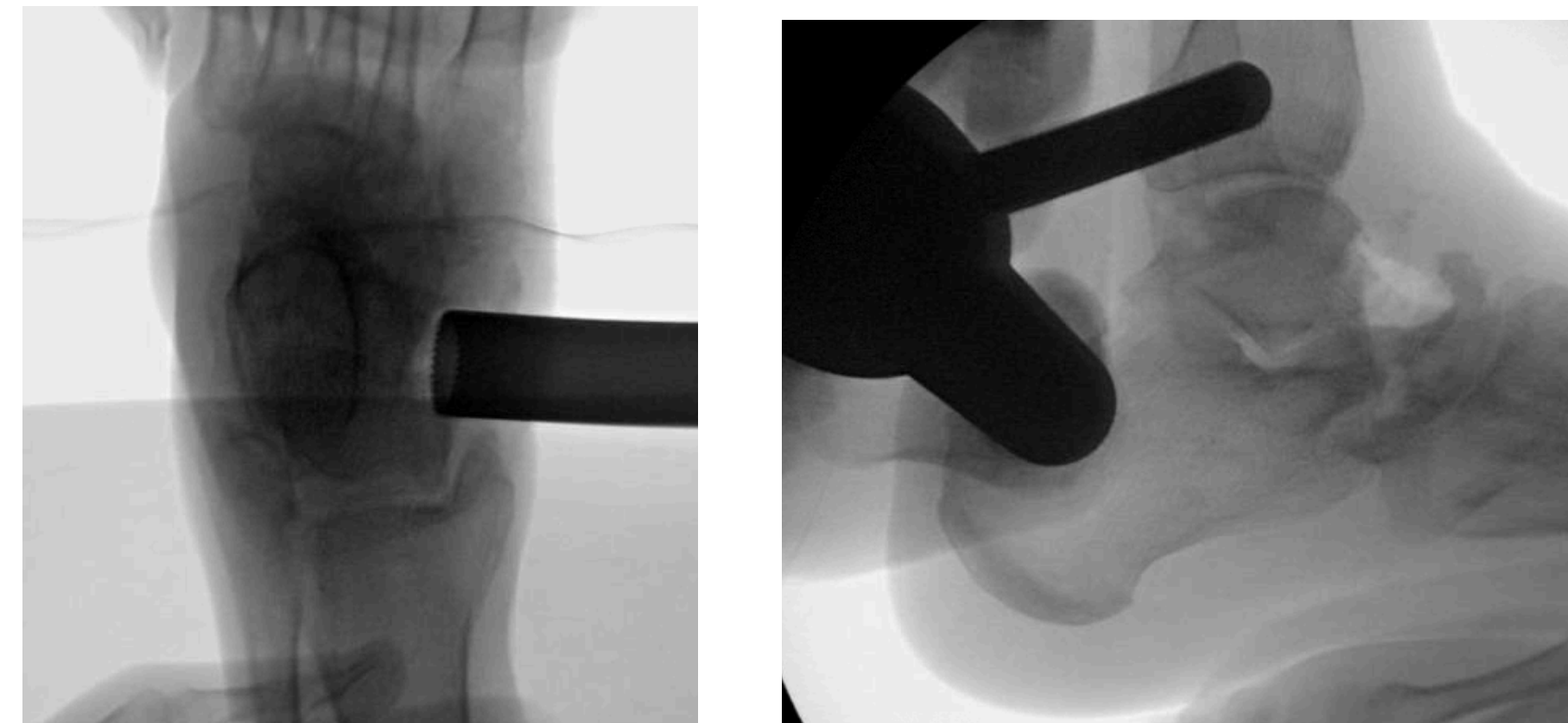


Figure 2A: Intra-operative view of trephine boring out defect within talar neck

Figure 2A: Intra-operative view obtaining calcaneal autograft with previous trephine

Results

Post-operative course was asymptomatic with no surgical or wound complications, and was only highlighted by an admission due to diabetic ketoacidosis. Currently, at thirteen months post-operatively the arthrodesis sites continue to consolidate with ongoing healing (Figure 5). The patient is fully recovered with a stable foot structure, and continues enjoying full activity with independent ambulation.

Figure 3

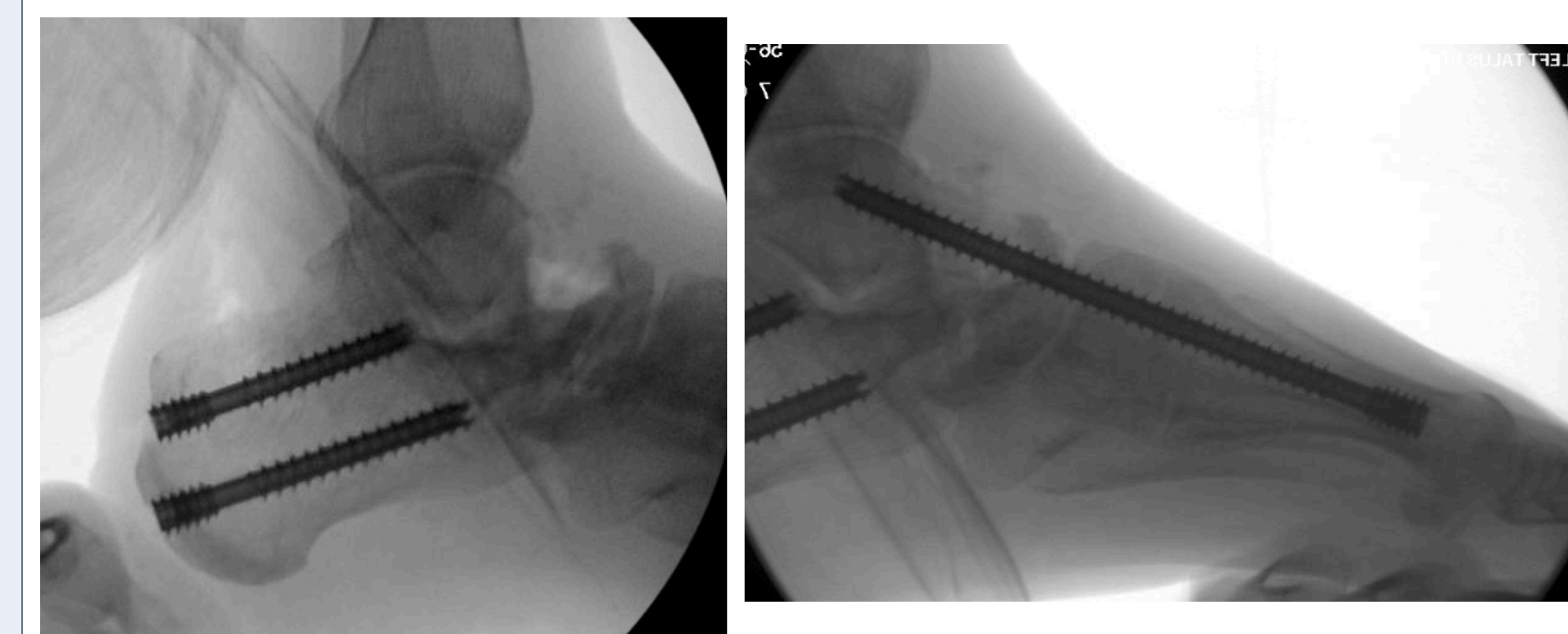


Figure 3A: Intra-operative view of 7.0 mm cannulated screws crossing autograft site within calcaneus .

Figure 3B: Fluoroscopic view of 7.0 mm beam spanning deficit with calcaneal autograft in place.

Figure 4

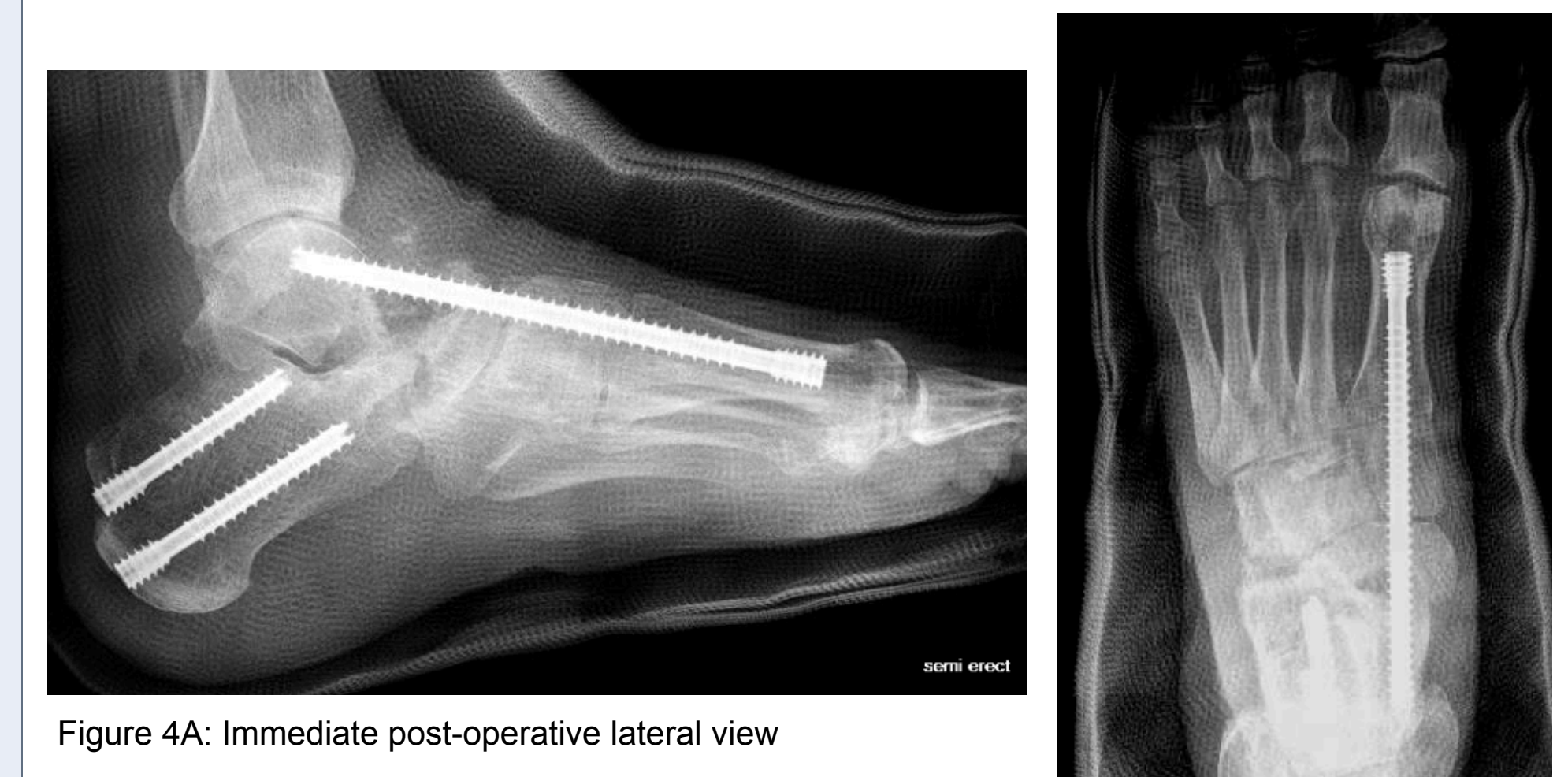


Figure 4A: Immediate post-operative lateral view

Figure 4B: Immediate post-operative AP view

Discussion

This case study details a Type 1 diabetic patient with Charcot neuroarthropathy and segmental bone loss within the talus secondary to infection and history of septic joint. Staging the procedures, especially in the present case, to allow for complete resolution of infection is of great importance for a successful outcome. One key advantage to using axial intramedullary fixation, as was done in this case, is that much less dissection is required to insert the screw than to place a plate and this technique prevents vascular compromise to the bone and decreases the rate of wound complications (7). Again, various techniques exist to successfully treat this condition, including internal fixation, external fixation, or a combination of both to achieve an adequate fusion of the Charcot foot. Whichever the management and techniques employed, it should establish a stable plantigrade foot that can be fitted in a custom molded shoe or device, and to prevent further ulceration (6).

Figure 5

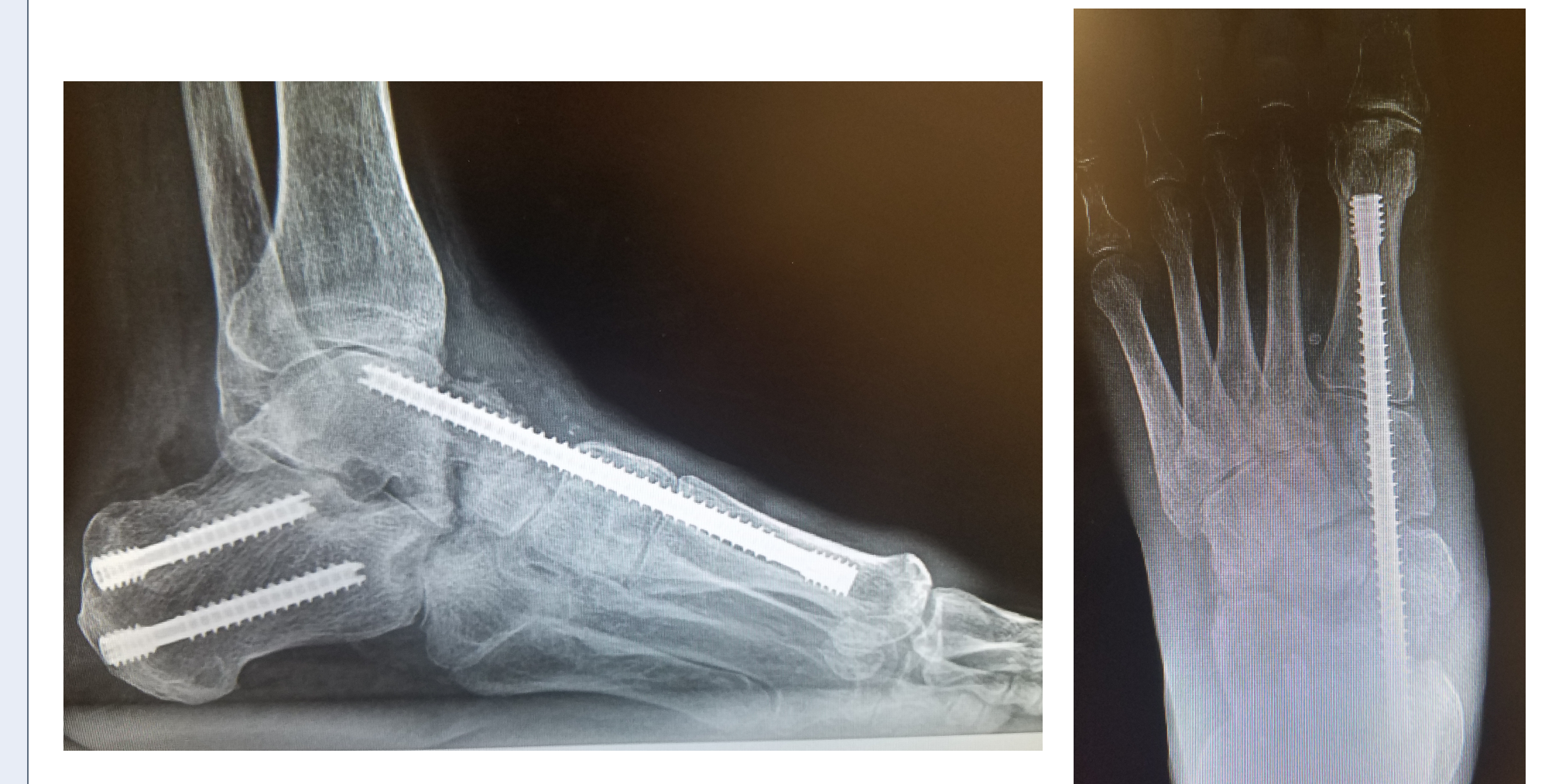


Figure 5A: Thirteen month post-operative lateral view showing osseous bridging and continued consolidation across talar neck deficit

Figure 5B: Thirteen month AP view showing ongoing consolidation.

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