



Avitus® Orthopaedics, Inc., White Paper 2019, TTC Fusion with Proximal Tibia Bone and Marrow Graft

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# CASE STUDY: TIBIOTALAR CALCANEAL (TTC) FUSION WITH PROXIMAL TIBIAL BONE GRAFT & MARROW HARVEST

BY  
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## OPERATIVE TECHNIQUE

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# **CASE STUDY: Tibiotalar Calcaneal (TTC) Fusion with Proximal Tibial Bone Graft and Marrow Harvest**

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## **CLINICAL PRESENTATION**

Patient (49-year-old male) complained of right ankle pain. Patient had noted decrease in range of motion and increasing pain with weight-bearing over the last year. Patient also stated that he had worsening neuropathy of unknown origin. No other significant medical problems were noted. Patient was a manual laborer and the pain was affecting his job performance and quality of life.

Based on the patient's complaints, presence of neuropathy, job as a manual laborer, and imaging (**EXHIBIT 1-EXHIBIT 4**), it was planned to perform a pantalar fusion including the calcaneocuboid joint. The plan was to use a nitinol tibiotalar calcaneal (TTC) hindfoot fusion nail, screws, and nitinol staples for the talonavicular (TN) and calcaneocuboid (CC) fusion. The Avitus® Bone Harvester (a suction powered bone harvesting device) would also be used to harvest cancellous bone and marrow fluid from the proximal tibia.

## **OPERATIVE TECHNIQUE**

A lateral, transfibular approach was taken to expose the ankle and subtalar joints and the excision extended to expose the CC joint. Once the fibular osteotomy was complete, the fibula was removed, and the joints were prepared using a power osteotome. A dorsal incision between the tibialis anterior and extensor hallucis longus tendons was then made to expose the TN joint. This joint was then prepared with the power osteotome as well.

Autograft bone harvest was then performed from the proximal tibia. Using an approach to the medial tibial metaphysis (**EXHIBIT 5**) at the level of the tibial tubercle, The Avitus® Pilot Hole Creator was utilized to breach a 1-cm cortical entry window for the harvester.

The Avitus® Bone Harvester was then inserted into the window, and a large volume of bone and marrow was quickly harvested. While cutting inside the intraosseous space, the active suction aspirated the bone chunks and marrow into the handle of the device. 35 CC's of cancellous bone and 25 CC's of bone marrow were harvested through a 1.5-cm incision in 5 minutes (**EXHIBIT 6**). The harvest site was then backfilled with coagulant powder into the metaphysis and a small, rolled-up gel foam was placed into the cortical window. Muscle fascia, periosteum, and skin were then closed.

The harvested autograft and fluid were then packed into all joints, and the deformity was corrected. No additional bone graft sources were needed. The TTC nail was then placed using the surgeon's standard technique. The calcaneal posterior to anterior screw of the TTC nail was also measured long to put into the cuboid as another point of fixation for the CC joint fusion. This was followed by a nitinol staple at the CC joint. The TN was then reduced; a nitinol staple and one TN screw were used (**EXHIBIT 7-EXHIBIT 9**).

## **POST OPERATIVE FOLLOW-UP**

Patient's wounds healed well. Tenderness and swelling around the bone graft harvest site resolved in the first 3-4 weeks. Patient was able to use a knee scooter without difficulty because of the medial placement of the incision for harvest.

By 8 weeks, there was radiographic evidence of significant fusion mass (**EXHIBIT 10**). Patient was weightbearing at 8 weeks in a boot and transitioned out of the boot at 16 weeks (**EXHIBIT 11**). Patient had no pain and had a CT at 7 months to confirm fusion per surgeon protocol (**EXHIBIT 12-EXHIBIT 14**). Patient had returned to work without difficulty with a rocker bottom shoe at 5 months.

## CONCLUSION



The Avitus® Bone Harvester provided a cheaper option to harvest a large quantity of autograft bone and marrow than autograft alternatives. The cost was a 1/3<sup>rd</sup> of the price of the orthobiologic protein typically used and obviated the need for any additional structural grafts. The rate of fusion was fast and robust. “It fused like gangbusters!”

I would recommend the Avitus® Bone Harvester for all fusions of the foot and ankle. When autograft is needed, consider using Avitus®. It has been a useful tool for our foot and ankle practice, and we will continue to utilize it.

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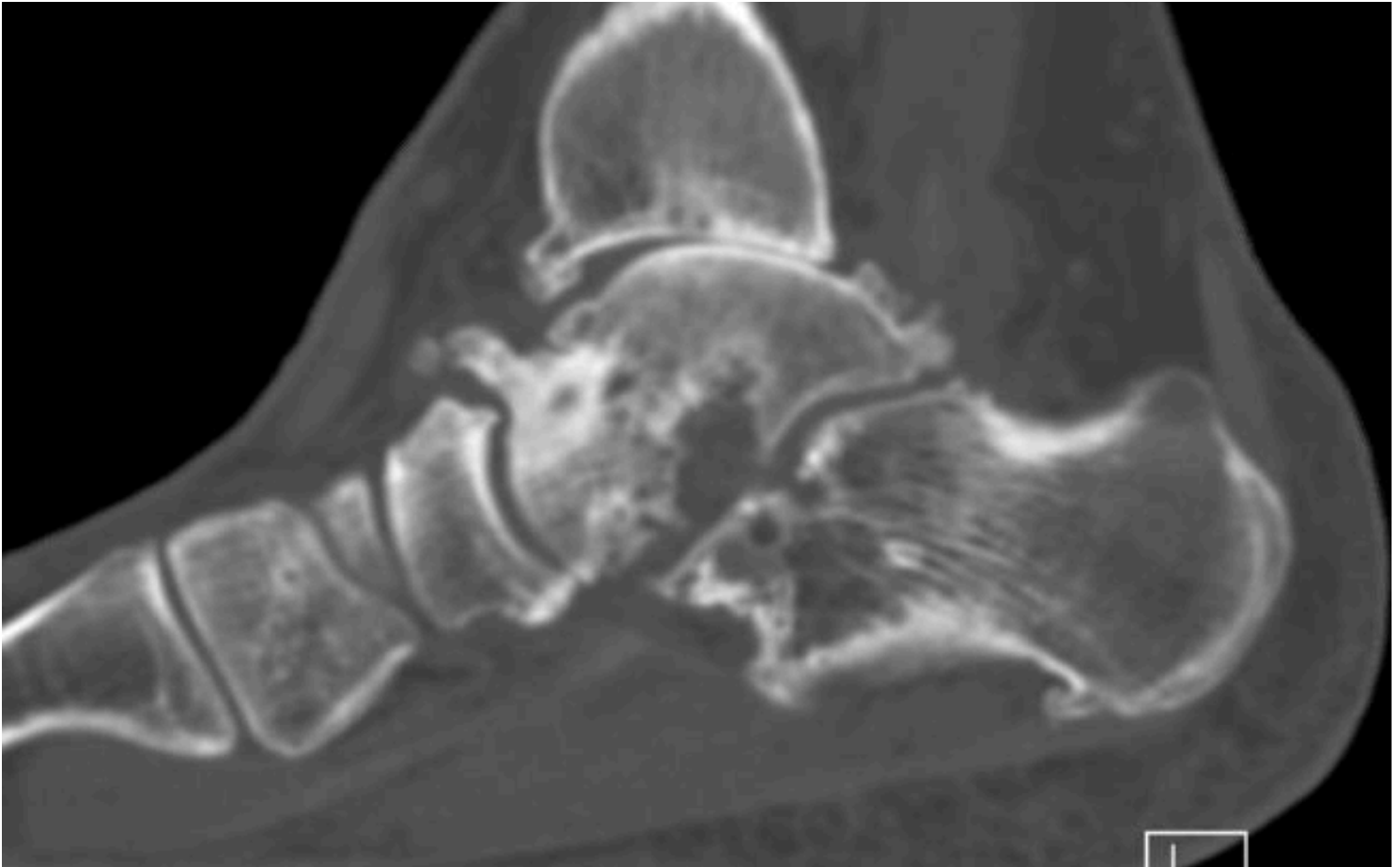
**EXHIBITS**



***EXHIBIT 1 :: Lateral radiograph of the foot and ankle demonstrating Pantalar arthritis with pes planus (pre-op)***



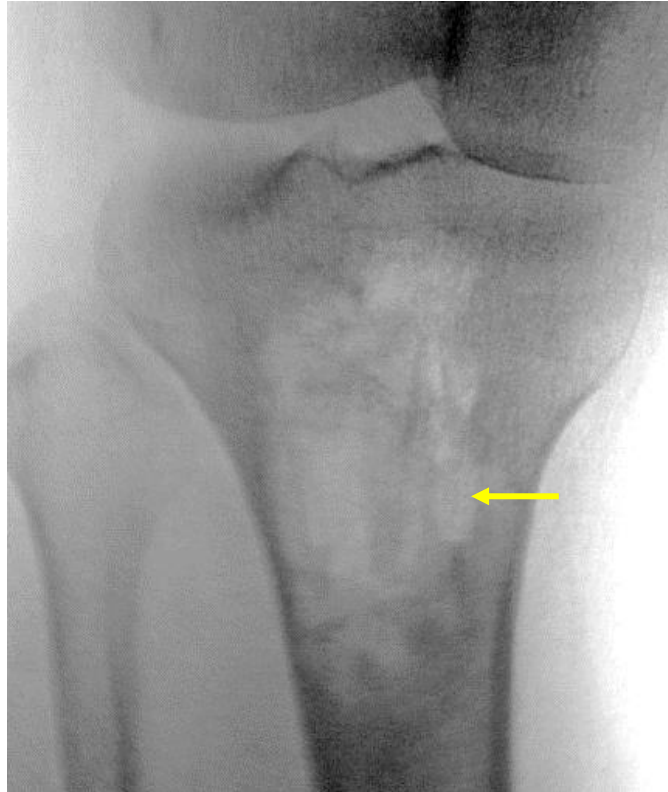
***EXHIBIT 2 :: AP ankle radiograph (pre-op)***



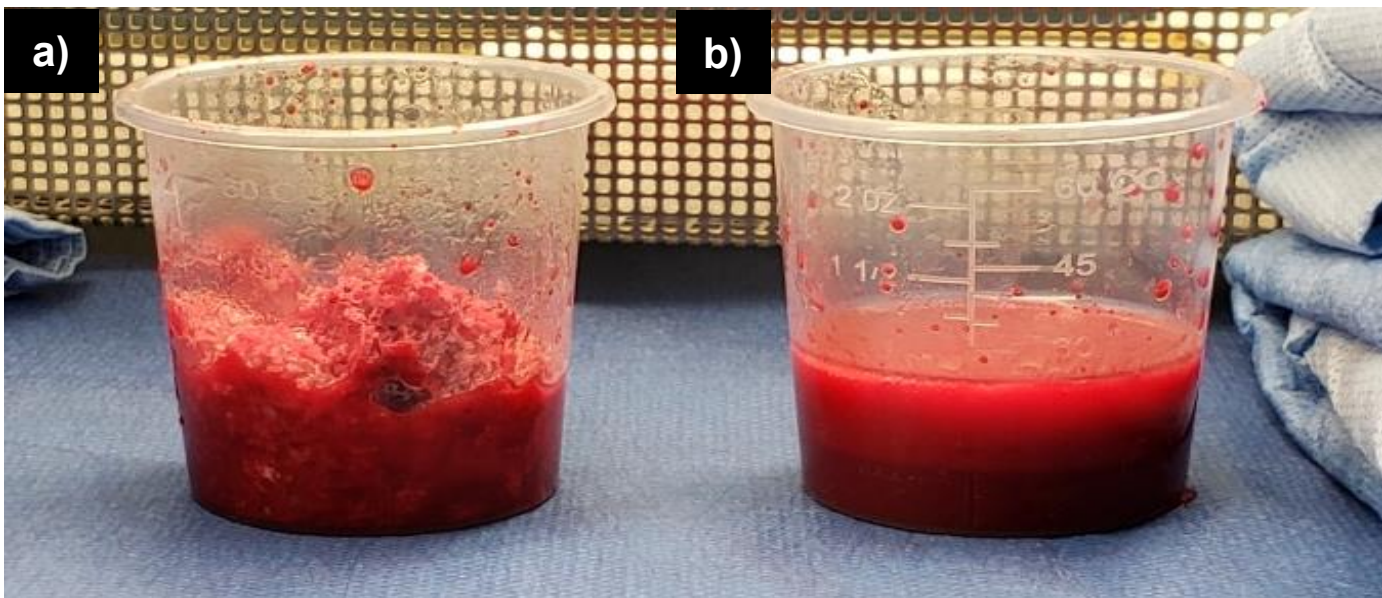
*EXHIBIT 3 :: Sagittal CT reconstruction slice demonstrating spurs, arthritis and cyst formation (pre-op)*



*EXHIBIT 4 :: Coronal CT reconstruction slice demonstrating the ankle and subtalar arthritis (pre-op)*

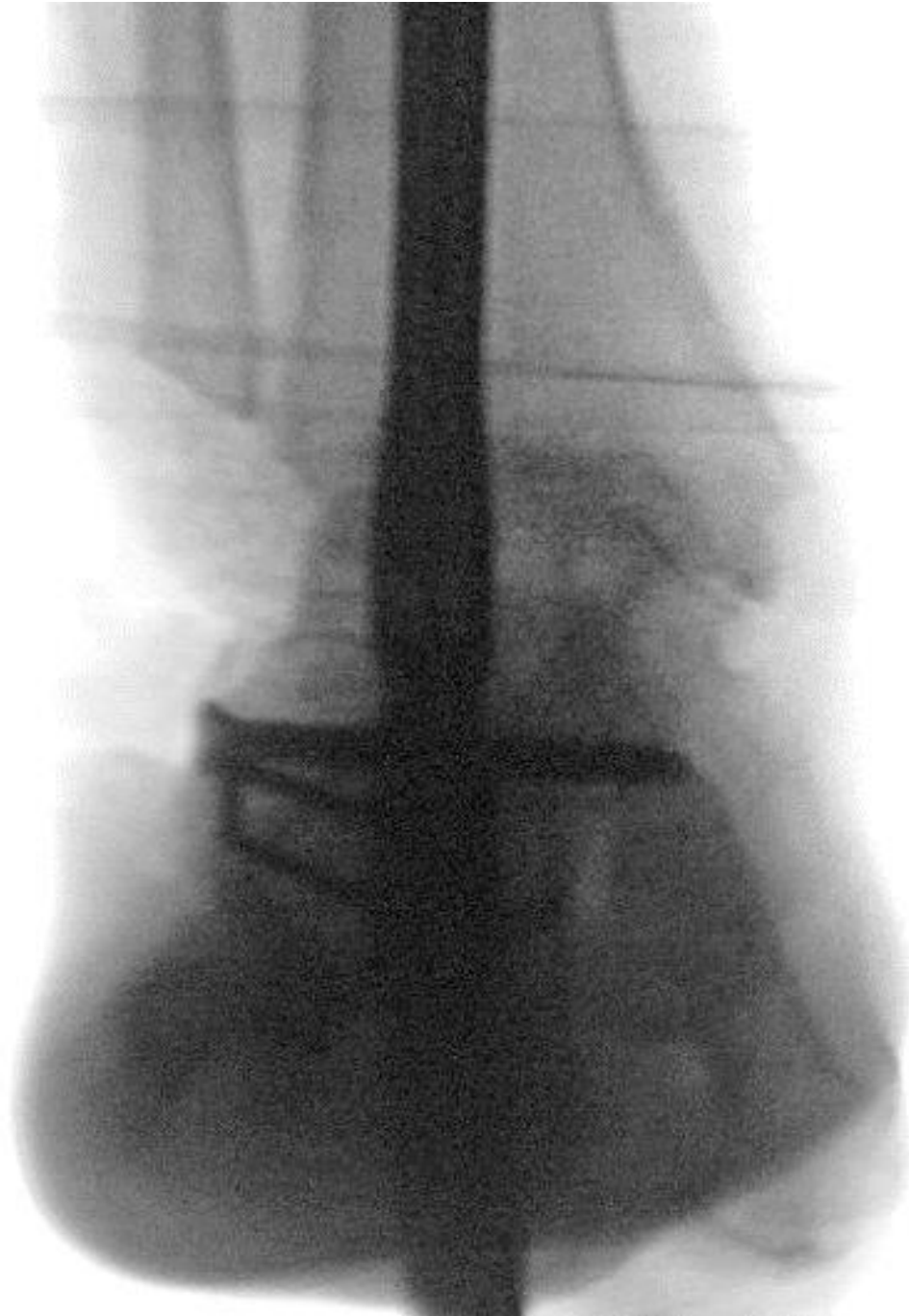


**EXHIBIT 5 ::** Intra-op radiograph displaying medial approach to proximal tibial bone and marrow harvest using the Avitus® Bone Harvester. 1-cm pilot hole highlighted.



**EXHIBIT 6 ::** a) 35 CC's of autogenous cancellous bone and b) 25 CC's of bone marrow were obtained in 5 minutes utilizing the Avitus® Bone Harvester.





***EXHIBIT 7 :: AP ankle radiograph (intra-op)***



***EXHIBIT 8 :: Lateral final radiograph (intra-op)***



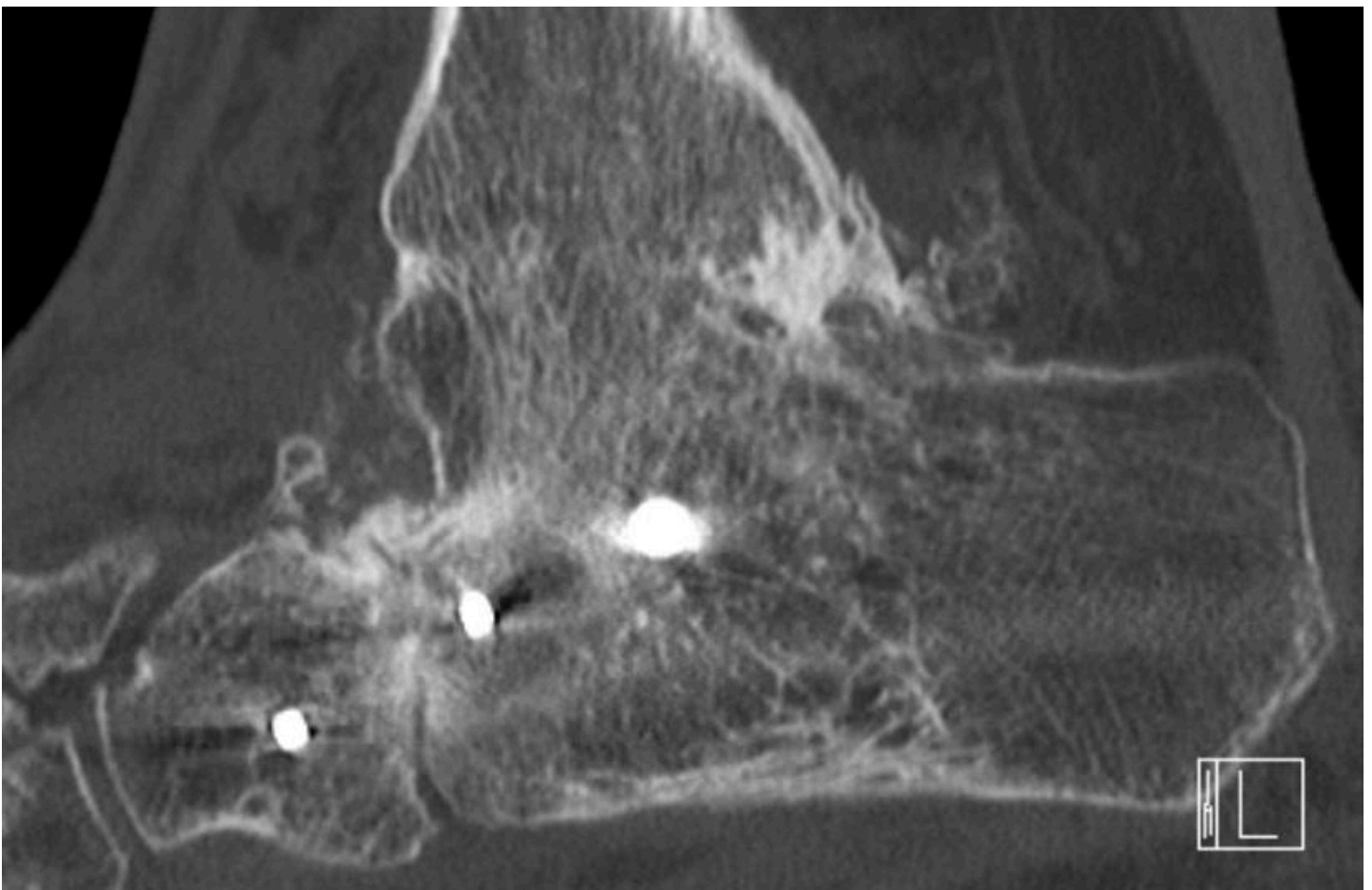
***EXHIBIT 9 :: Final AP foot radiograph (intra-op)***



**EXHIBIT 10 :: 2 month post op radiograph follow up a) coronal b) AP c) lateral views**



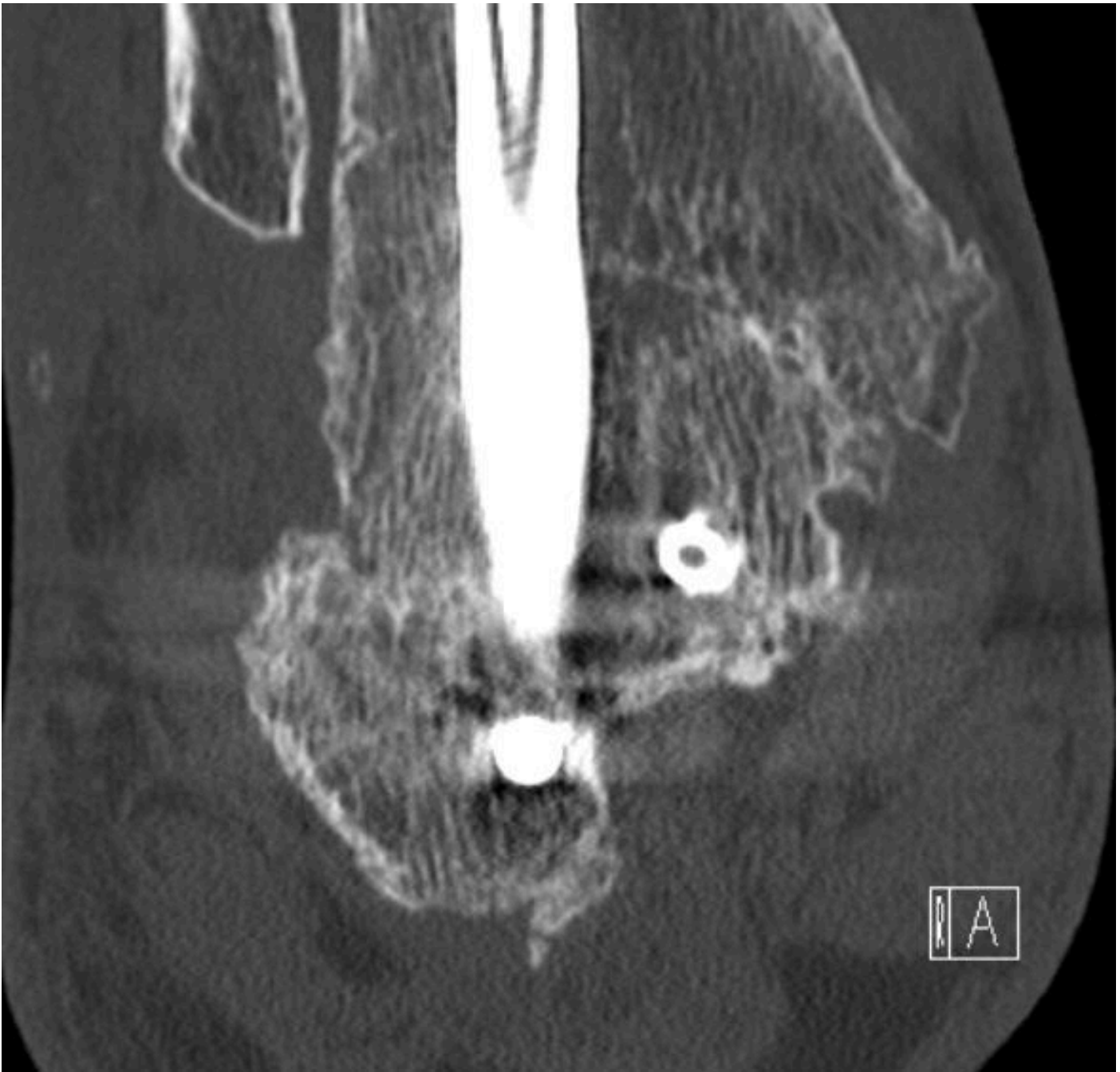
**EXHIBIT 11 :: 4 month post-op lateral radiograph showing fusion of joints. Patient transitioned out of boot at this point.**



**EXHIBIT 12 :: 7 month post-op sagittal CT scan slice showing ankle, subtalar and CC joint fusions**



***EXHIBIT 13 :: 7 month post-op Sagittal CT Scan slice showing TN and Ankle fusions***



**EXHIBIT 14 :: 7 month post-op coronal CT scan slice showing ankle and subtalar fusions**