

## STATEMENT OF PURPOSE

Charcot arthropathy is a debilitating disease which involves progressive joint destruction which left untreated can lead to ulcerations, osteomyelitis, amputations, and increased morbidity. We present a unique way of achieving arthrodesis of the calcaneus and tibia on a patient with a history of multiple ankle fractures, chronic osteomyelitis with removal of talus, and previous attempted Charcot reconstruction. It is imperative to understand the underlying causes and comorbidities of the patient prior to selecting the correct surgical intervention on a patient with an extensive history of Charcot arthropathy.

## LITERATURE REVIEW

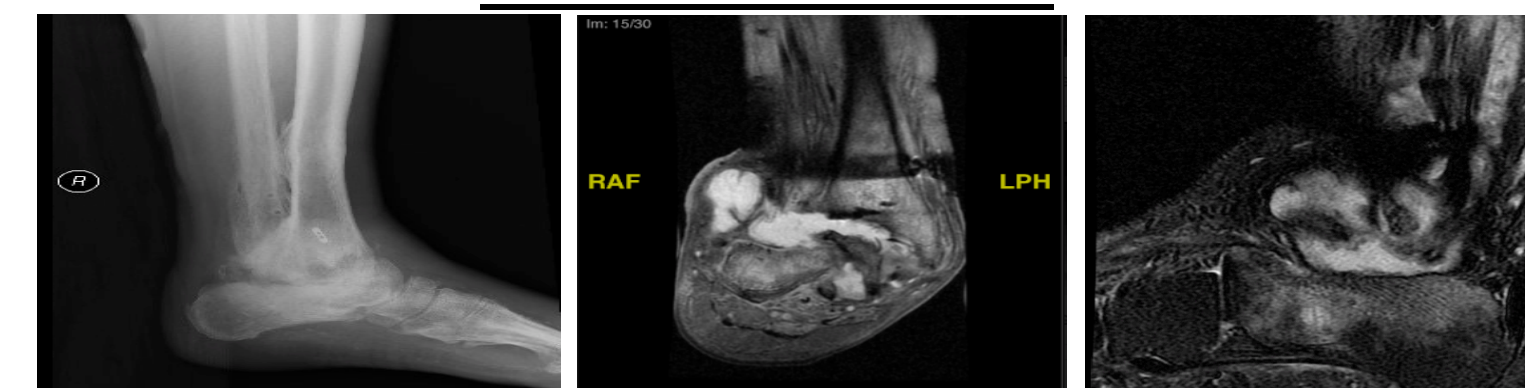
- ◆ Among patients <65 years old at the end of follow-up, amputation risk relative to patients with Charcot alone was 7 times higher for patients with ulcer alone and 12 times higher for patients with Charcot and ulcer [1]
- ◆ Feet affected by Charcot arthropathy are unlikely to ulcerate when they remain clinically plantigrade and the radiographic weight-bearing relationship between the hind foot and forefoot is collinear [2]
- ◆ A metallic nail or plate of any type may not provide adequate fixation in an ailing bone with severe osteopenia and a wide medullary canal. To achieve union of osteopenic bone, a stimulating factor in the form of an autologous bone graft may encourage the initiation of osteogenesis [3]
- ◆ Charcot patients have multiple co-morbidities, such as obesity, osteopenia, and osteomyelitis, which pose a challenge when using internal fixation. Furthermore, revision surgery for internal hardware removal in these patients increases their morbidity risk, particularly since this type of fixation involves large dissections. External fixation can be a favorable alternative when long-term correction is needed in these individuals. [4]
- ◆ It was imperative that the rearfoot deformity is fused into proper alignment to allow a stable plantigrade foot, and reduce joint breakdown due to improper biomechanics. [4]
- ◆ The nonunion rate has been shown to be high in many studies, ranging from 10% to 25%. The chances of achieving successful arthrodesis diminish further in the presence of comorbidities such as diabetes, smoking, and poor bone stock. [5]

## CASE STUDY

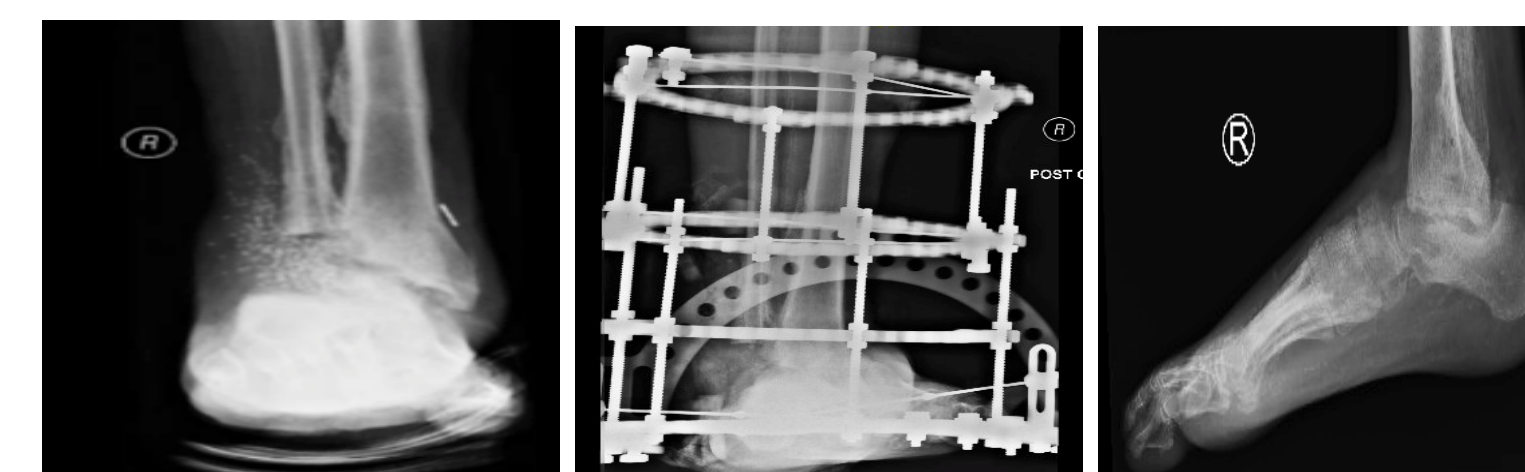
- ◆ A case is presented of a 64 year old Hispanic obese male with a significant past medical history of uncontrolled diabetes with peripheral neuropathy, multiple previous ankle fractures to the right ankle, Charcot arthropathy, osteomyelitis, and peripheral arterial disease.
- ◆ The patient presented with an extensive history of Charcot arthropathy to the right ankle with a lateral ankle ulceration and acute osteomyelitis
- ◆ Imaging confirmed the presence of complete joint destruction and loss of integrity to the right ankle joint and subtalar joint with a prominent valgus rearfoot deformity
- ◆ Due to the extensive soft tissue and bone necrosis, a limb salvage procedure was planned with the patient aware that they were at high risk of below knee amputation
- ◆ **Management of Acute Osteomyelitis- Initial Wide Debridement**
  - ◆ Debridement of all nonviable soft tissue to the right lateral ankle with complete removal of the distal 1/3<sup>rd</sup> of the right fibula and curettage of all nonviable bone to the right tibia with application of antibiotic beads
- ◆ **Initial Charcot Reconstruction** (Status Post 1 week)
  - ◆ Complete removal of the right talus due to extensive necrosis to the body and head of the right talus
  - ◆ Tibiocalcaneal fusion with application of allogenic bone graft to the right tibia via external fixation device and Ilizarov technique of compression
  - ◆ Local advancement skin flap to the right lateral ankle with tendoachilles lengthening of the right Achilles
  - ◆ External fixation device removed after 16 weeks
- ◆ **Revisional Charcot Reconstruction** (Status Post 18 months)
  - ◆ Medial column fusion of the first metatarsal-cuneiform joint
  - ◆ Tibiocalcaneal arthrodesis with application of intramedullary fibular allograft
    - ◆ 10cm fibular allograft with a 10mm diameter drilled bicortically prior to insertion
    - ◆ Demineralized bone matrix was then applied within the intramedullary canal of the fibula prior to insertion
    - ◆ 11mm reamer used through the plantar aspect of the calcaneus through the ankle joint into the medullary canal of the tibia
  - ◆ Application of static external fixation device to the right lower extremity with compression applied through the right ankle joint and right medial column
  - ◆ External fixation device removed after 16 weeks and patient fitted for extra depth extra wide diabetic footwear.

## RADIOGRAPHS

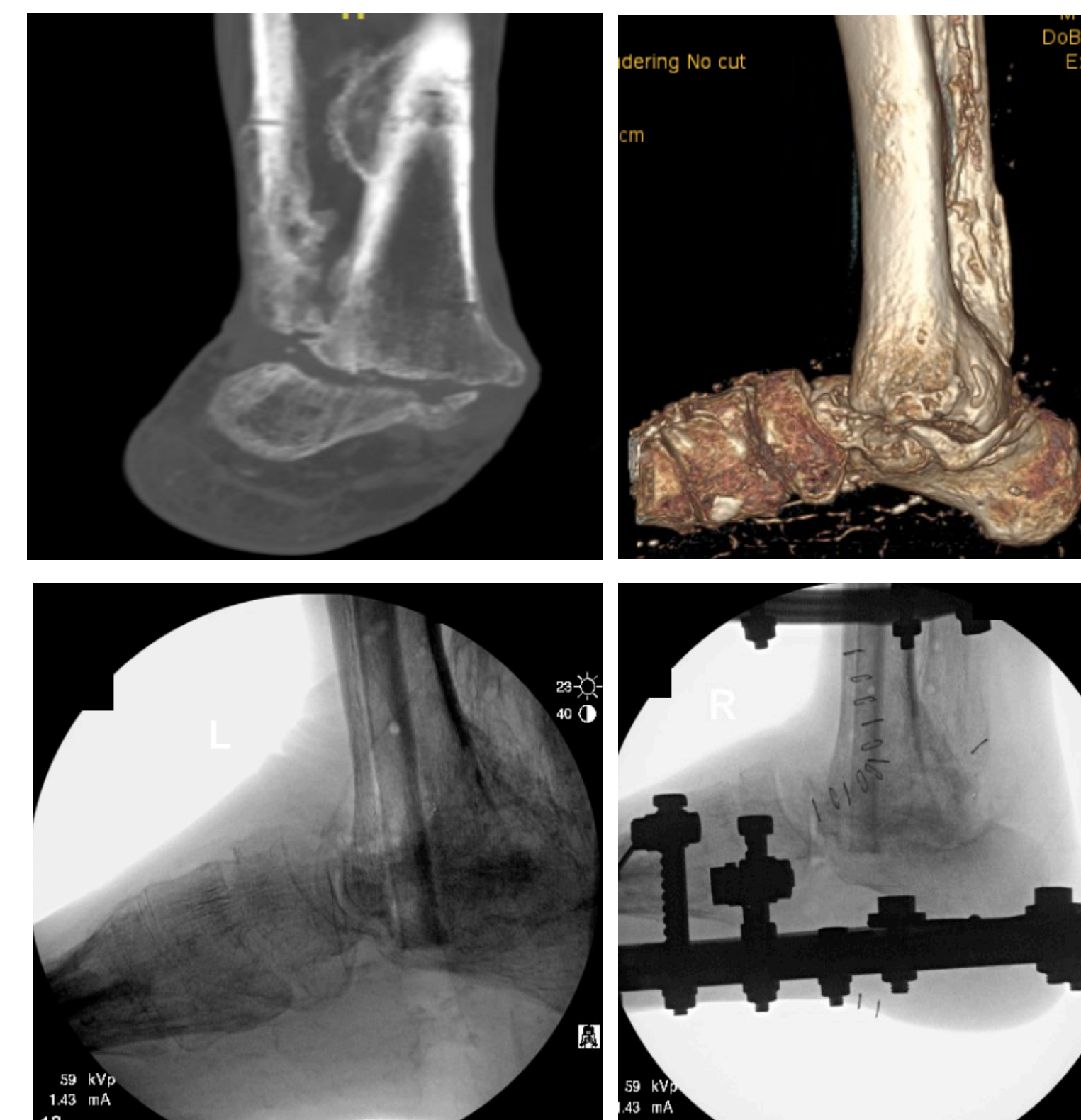
### Initial Presentation



### Initial Charcot Reconstruction



### Revisional Charcot Reconstruction



## DISCUSSION

This case study presents a unique way of long-term management of Charcot arthropathy in a patient with an extensive history of ankle trauma, Charcot arthropathy, ulcerations, and osteomyelitis to the hindfoot. Due to necrosis of the right talus from chronic osteomyelitis caused by ulcerations from Charcot arthropathy, the right talus was removed which created an unstable hindfoot. There are multiple techniques described in the literature to achieve adequate and stable arthrodesis of the hindfoot. This involves the utilization of multiple screws, plate and screws, external fixation, intramedullary nail, or used in combination. It is important to note that this approach has been utilized, for the most part, as a salvage technique in the revisional management of complex nonunion or failed arthrodesis. A biomechanically stable plantigrade foot is cited as the ultimate desirable result throughout the literature. Over 90% of the cases we reviewed in the literature utilized vascularized fibular autograft. It is well documented in the literature the osteogenic, osteoinductive, and osteoconductive properties of autograft thus making it the preferred graft form when dealing with complex cases of fusion failure. Allograft, although lacking osteoblasts which are lost during the freeze-drying process, still provides osteoconductive properties which acts as scaffold for new bone formation.

Due to osteomyelitis and the removal of the distal 1/3<sup>rd</sup> of the fibula, fibular autograft was not a viable option. This study presents a unique way of achieving fixation through the use of a fibular allograft in a patient with nonunion of the ankle joint from previous attempted Charcot reconstruction, osteopenic bone, and bony deficits from a history of chronic osteomyelitis and Charcot arthropathy. Management of the acute osteomyelitis and maintaining joint stability is crucial in the long-term success of limb salvage when faced with this particular scenario. It is imperative to understand the underlying causes of Charcot, its different connotations, and associated comorbidities. This is the paramount importance when choosing the correct surgical procedure, especially in the presence of ulcerations and osteomyelitis.

### 24 Month Follow-Up



## REFERENCES

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4. Baddalo T, Mendez N, Ramos R, Cala M, Merrill, T. Charcot Neuroarthropathy Reconstruction Using External Fixation: A Long-Term Follow-up. Podiatry Institute 2017; 26:115-120
5. Shah AB, Jones C, Elattar O, Naranje SM. Tibiocalcaneal Arthrodesis With Intramedullary Fibular Strut Graft With Adjuvant Hardware Fixation. JFAS 2017; 56:692-696