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Charcot Foot Limb Salvage Procedure with External Fixation and Medial Column Lengthening: A Case Presentation

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Charcot neuroarthropathy is a debilitating disease, which affects nearly a third of diabetic patients with peripheral neuropathy. Many of these cases result in below knee amputation due to secondary complications associated with this condition such as chronic ulceration with subsequent soft tissue infection and osteomyelitis. Previous studies have shown the effectiveness of utilizing external fixation and medial column arthrodesis to achieve a stable plantar grade foot in patients with Charcot neuroarthropathy. In this case we present a patient who has a complex deformity due to a previously shortened and hyper-mobile 1st ray combined with an ankle and forefoot valgus deformity. Through the utilization of previous modalities combined with restoration of 1st ray length, a stable plantar grade foot was achieved preventing below knee amputation.

Key words: Charcot Foot, Limb Salvage, Medial Column Lengthening.

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Charcot neuroarthropathy is a progressive condition that results in the destruction of single or multiple joints characterized by subluxation, dislocation, and osseous destruction[1]. Eventually, the Charcot process proves to be self-limiting and enters a quiescent phase, leaving the patient with an irreversible condition, in addition to an increased risk for secondary ulceration[4]. Complicated by peripheral neuropathy, the syndrome historically left the affected individual with the loss of the affected limb[2]. Pathogenesis is related to stress induced repetitive micro-trauma or acute injury on the affected lower extremity that has a loss of protective sensation[3].

Because of a traditional understanding that management of Charcot neuroarthropathy often resulted in non-practical ambulation, in the past many surgeons would choose to perform an amputation[3]. Charcot affects only 1% of diabetics, however it has been reported in a staggering 29% of diabetic patients with peripheral neuropathy and loss of protective sensation[3]. Take into mind that the survival rates for diabetic amputations at 5 years is only 50%[3], and it becomes evident that a need for alternative treatment modalities is high in demand. Today, an increasing number of surgeons are advocating for earlier intervention of Charcot changes[5].

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To reinforce the concept that increased surgical intervention is needed, we present a case in which below the knee amputation was prevented through the use of an autologous bone grafted 1st ray, external fixation and tri-planar deformity correction.

Case Study

A 56-year-old male with a history of diabetes and Charcot joint disease presented with a chief complaint of left foot deformity with severe pain on weight bearing due to pressure under the medial malleolus and medial plantar foot ulcer. The patient had a previous left 1st metatarsal head resection due to chronic osteomyelitis. When the patient initially presented to the Mercy Emergency Department on June 4, 2012, a malodorous, purulent draining ulcer was noted to the left 1st metatarsophalangeal joint with a total area measuring 2.5 cm. The patient was noted to be completely neuropathic. The left foot and ankle were noted to be in severe valgus position, and the 1st metatarsophalangeal joint (MPJ) was dislocated. Infectious disease consults recommended a below knee amputation due to the extent and chronic nature of the condition. However, following podiatry consult, serial incision and drainages (I&D's) with IV antibiotics, and future limb salvage reconstructive surgery was recommended upon infection control. In the period between June 2012 through to November 2012, six successful I&D's with bone debridements were performed, resulting in control of infection. At that time, a decision was made to attempt to reconstruct the patient's left lower extremity utilizing an external fixation frame.

On November 18, 2012, the patient was brought to the Mercy Operating Room for surgical correction of left Charcot joint disease. After general anesthesia was induced, attention was directed to the medial malleolus where a sagittal saw and blade was used to shave down all hypertrophic bone. A transverse cut from posterior to anterior was made with an osteotome and mallet on the medial malleolus to create a varus wedge. The wedge on the medial malleolus was closed for the left tibial correctional osteotomy.

Figure 1 Left: Postoperative lateral radiograph showing bone graft placement, as well as, 1st ray extended length Right: Preoperative lateral radiograph showing shortened 1st ray.

Next, all cartilage was removed from the ankle in preparation for fusion. Autograft and allograft (Trinity Evolution) was applied to the ankle fusion site and the ankle varus wedge. Attention was then directed to the first MPJ, where all chronicity of the joint was resected, and the bones were fenestrated for fusion of the first MPJ. Autograft measuring 12.8mm x 8.5mm. (Fig. 1) taken from the tibial varus wedge osteotomy was introduced into the site to facilitate fusion, and restore length to the 1st metatarsal. An Orthofix MiniRail was applied to the 1st MPJ.

Two pins were placed proximally on the 1st metatarsal shaft and two distal pins were placed on the proximal phalanx. An elliptical incision was made over the medial and plantar aspect of the 1st MPJ to excise the skin ulcer of this area. Under fluoroscopy, correction of the deformity was achieved and medial arch height of the foot was restored resulting in a better anatomic position. K-wires (.062) were used to fuse the joint, and kept to recreate a high medial arch. An Orthofix external ring fixator was applied to the extremity with 2 olive wires in the proximal tibia, two olive wires in the distal tibia, two olive wires in the calcaneus, and 3 olive wires placed in the forefoot for anatomic correction. (Fig. 2)

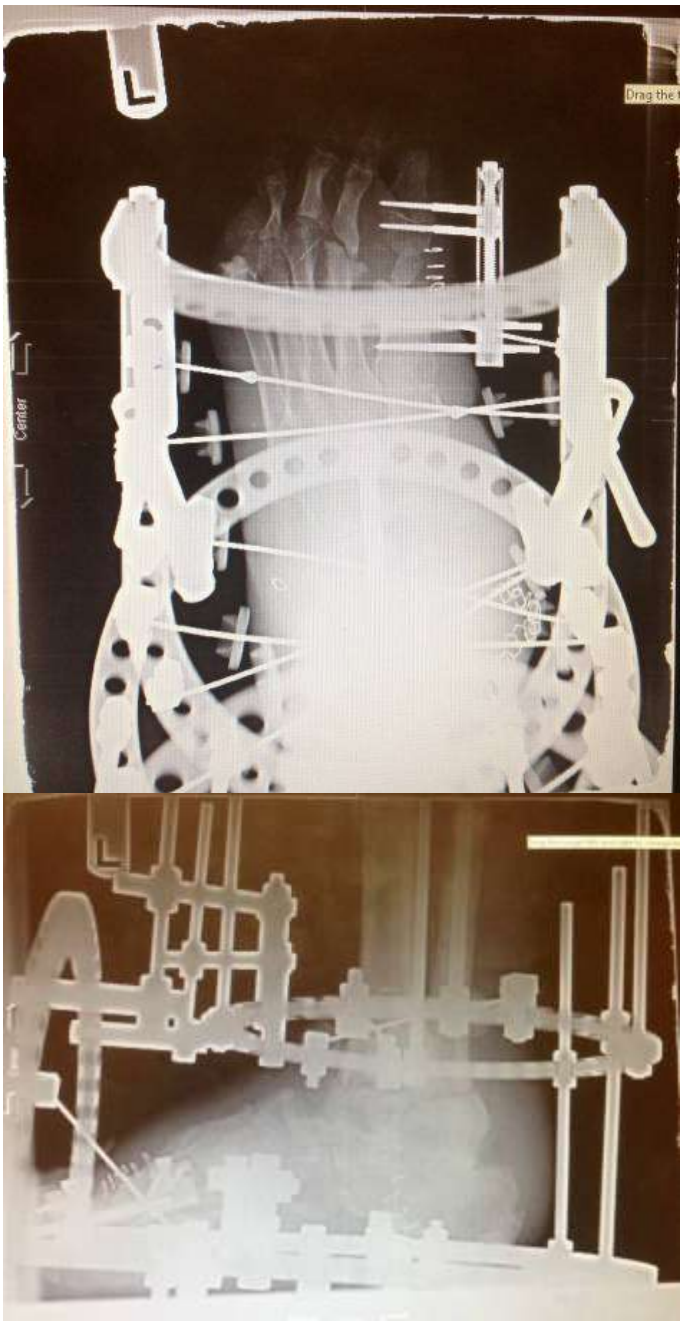

Figure 2 Top: Dorso plantar intra-operative radiograph showing placement of external fixator and monorail. Bottom: Lateral intra-operative radiograph showing placement of external fixator.

The ring external fixator consisted of 2 circular rings and 2 foot plates. The case progressed successfully to wound healing and primary fusion after 10 weeks.

Figure 3 Top: Postoperative radiographs showing removal of hypertrophic bone formation as well as fusion of ankle joint. Bottom: Preoperative radiographs showing hypertrophic bone formation.

In follow-up visits, the patient states he is able to ambulate pain free and without assistance. Post-operative x-rays reveal fusion of the ankle joint (Figure 3), and correction of valgus deformity (Fig. 4) as well as fusion of the 1st MPJ with achievement of a more accurate length of the 1st metatarsal.

Figure 4 Left: Postoperative radiographs showing forefoot valgus correction. Right: Preoperative radiographs showing forefoot valgus deformity.

This case presents a patient with a complex deformity in which chronic ulceration is due to a hyper-mobile first ray combined with a previously shortened 1st metatarsal. Prior studies have shown the effectiveness of external fixator use[1], as well as medial column arthrodesis[6], in the management of patients with Charcot neuroarthopathy. By combining these two previous treatment modalities with extension of the 1st metatarsal, through the usage of an autologous bone graft, a stable plantar grade foot can be achieved. (Fig. 5)

Conclusion

Below knee amputation is often the recommend procedure in Charcot joint disease patients with chronic non-healing ulceration and significant deformity[3]. The successful utilization of acute tri-planar correction, external fixation and autologous bone graft provides an alternative treatment for those patients with complex Charcot foot deformities.

Figure 5 Left: Postoperative stable plantar grade L-foot free of ulceration. Right: Preoperative unstable L-foot with ulceration.

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