Staged Soft Tissue and Osseous Correction of Combined Charcot Ankle and Subtalar Joint Neuroarthropathy

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Statement of Purpose

The purpose of this poster is to present a case of a salvaged limb which was afflicted with Charcot neuroarthropathy at multiple sites. The patient underwent a staged soft tissue and osseous procedure involving internal and external fixation to both maintain limb length and create a stable foot and ankle with decreased pain.

Introduction

Charcot neuroarthropathy is a condition which affects the neuropathic extremity characterized by joint dislocations, pathologic fractures, and debilitating deformities. Generally, options for management of the disease in the post-acute stage involve external bracing for extended periods, often lifelong, or surgical correction which is often highly invasive. Highly important in the surgical setting is the correction of not only the osseous deformity, but the release of soft tissue to allow for boney manipulation.

The complete soft tissue release of the ankle and subtalar joints prior to a second osseous procedure has, to our knowledge, not been described in the literature. Herein we present a case involving release of all soft tissue structures at the level of the ankle joint to allow for staged soft tissue and then osseous correction of the patient's deformity.

Initial Presentation

A 53 year old male presented with a complaint of dislocated right ankle which had been present for several months. The patient had been essentially non-ambulatory since the onset of the deformity and had seen multiple physicians at outside hospitals prior to presentation. He had been diagnosed with Charcot joint and right fibular fracture and offered below-knee amputation and desired a second opinion. After examination, it was determined that the patient would require a staged procedure involving initial soft tissue release and external fixation, followed by a likely tibio-talo-calcaneal arthrodesis at a later date. The patient was then again given the option of a below-knee amputation and then given the above second option to salvage his lower extremity.

Physical exam revealed non-pitting edema to the right lower leg and ankle. Neurologic sensation was noted to be absent to the entire right lower extremity distal to the ankle and diminished distal to the tibial tuberosity. Vascular exam revealed palpable pulses with good digital perfusion. The right foot was noted in rigid varus about the ankle joint. Range of motion about the ankle and subtalar joints was minimal. The right foot was essentially planus with arch collapse noted. Imaging demonstrated a varus subluxation of the right ankle joint with Charcot-like changes to the subtalar and tarso-metatarsal joints of the right foot as well as right distal fibular fracture (Figures 1-3).

Initial Imaging

Figure 1

Figure 2

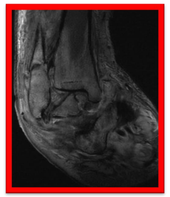

Figure 3

Stage One

To correct the valgus deformity noted in the images above (Figures 1-3) the patient was placed on the operating table in the supine position. Closed reduction under fluoroscopy was performed to reduce the osseous deformity and correct, as much as possible, the fibular fracture in order to provide the ankle with better long-term stability. The was duly performed with adequate osseous reduction observed. Steinmann pins were inserted from the plantar foot across the subtalar and ankle joints for temporary fixation.

An was then made to the medial aspect of the right ankle joint. The medial capsule was released followed by the lateral capsule and peroneal tendons. Medial and lateral release of the subtalar joint and associated ligaments was also carried out. Percutaneous Achilles tenotomy was also performed. A flat drain was inserted into the ankle joint to prevent hematoma. After the soft tissue release, the patient's right lower extremity was placed in a ring external fixator to maintain position and length.

Postoperatively, the patient was admitted to regular nursing floor and was then discharged to skilled nursing facility where he remained until stage two of surgery. The drain was pulled prior to discharge from hospital and the patient healed his medial and lateral incisions without incident.

Postoperative Imaging

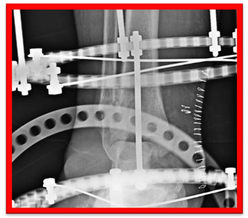

Figure 4

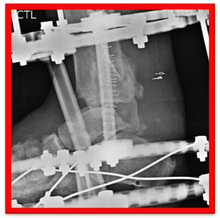

Figure 5

Stage Two

One month after initial procedure, the patient was returned to the operating room for definitive osseous procedure. First, the external fixator device was removed from the patient's right lower extremity. The leg was then prepped in the usual sterile fashion for the arthrodesis procedure.

A stab incision was then made to the proximal leg overlying the anterior tibial surface. Jamshidi needle was then inserted and 60cc of bone marrow aspirate was withdrawn from the tibia. This bone marrow aspirate was then spun down into bone marrow aspirate concentrate for later use at the arthrodesis site.

Dissection was then carried out to the lateral ankle for preparation of the subtalar and ankle joints. The fibula was transected and while maintaining the venous and arterial supply to the newly created distal fibular graft, it was reflected posteriorly for joint preparation. Once joint preparation with curettage and power burr was complete, the vascularized fibula was then used as a medially-decorticated onlay graft and was fixated using a fibular plate in order to facilitate additional bone growth.

Dissection was then carried out plantarly for placement of an intramedullary tibial rod. This was inserted under fluoroscopy per manufacturer's recommendations and was secured into place with screws to allow for compression of the arthrodesis sites. Additionally, bone marrow aspirate concentrate was sprayed on the IM nail and was introduced to the arthrodesis sites prior to nail implantation. Platelet-rich plasma and platelet-poor plasma were also used to assist with modulation of inflammation at the surgical sites and with hemostasis.

After closure, the patient was placed in a below-knee cast and was admitted to the hospital postoperatively where he remained for three days postoperatively. He was then again discharged to skilled nursing facility to allow for continued non-weight bearing and to also allow for intensive physical therapy upon clearance.

Figure 6

Figure 7

Postoperative Course

The patient went on to uneventful healing of the procedures described. CT performed three months postoperative did demonstrate good joint bridging and intact hardware. Unfortunately, the patient presented seven months postoperatively with complaint of right distal hallux ulceration. Imaging performed at that time indicated osteomyelitis of the first distal phalanx as well as loosening of the intramedullary rod of the right ankle though without overt sign of infection or osteomyelitis to the area of the nail (Figures 8-9).

Because of the adequate fusion to the hindfoot, and out of an abundance of caution given the forefoot osteomyelitis, the IM nail was also removed in the same procedure as a partial hallux amputation. Intraoperative findings demonstrated no suspicion for osteomyelitis in the hindfoot or tibia and the hindfoot was flushed thoroughly and closed with suture.

Figure 8

Figure 9

Figure 10

After closure, the plantar aspect of the patient's heel overlying the former nail site did dehisce and formed a chronic ulcer to the right plantar heel (Figure 10). After several weeks of local wound care involving debridement and biologic grafting, the patient did proceed to heal. At time of the creation of this poster, the patient is fully closed and is ambulatory in a brace and diabetic offloading shoe gear.

Discussion and Conclusion

This gentleman presented a very unique and difficult limb salvage situation given the nature and severity of his deformity. It has been reported and is likely accurate that Charcot neuroarthropathy which involves the ankle caries among the highest risk of amputation due to the inherent instability and potential for pathologic fracture. Certainly multiple joint involvement would increase the risk of amputation. The duration of his condition also presented a unique situation as the soft tissue structures had adapted to the deformity and therefore required release and stabilization prior to the definitive surgery. Complicating this patient's course was his development of osteomyelitis to the right hallux which necessitated partial amputation and removal of the intramedullary nail to prevent potential hardware infection.

A staged procedure was performed to allow not only stabilization of the ankle and subtalar joints and reduction of the varus deformity, but also to allow for stabilization of the soft tissue envelope in between surgeries. This patient has a documented history of poor healing, as is partially documented in this presentation, and it was deemed unwise to perform an invasive soft tissue release in addition to an open reduction and internal fixation of the fibula and an additional intramedullary nail procedure at the same time. We therefore allowed for a period of recovery between cases. In the end, the patient did well after a four week period of convalescence from the initial procedure.

Arthrodesis was chosen as the final procedure for this patient as it has been shown to have positive outcomes in the unstable and/or painful Charcot foot. This patient was able to proceed on to relatively normal function after fusion and completion of wound care post-dehiscence. His great toe also healed uneventfully after primary closure in surgery.

Regarding patient selection and potential complications, the physician must be prepared to manage complications such as infection, hardware failure, dehiscence, etc. Patient compliance is essential and practitioners must balance the desire to salvage the limb with the patient's level of compliance.

References

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