CASE REPORT

Salvage of Chronic Therapy-Resistant Bilateral Charcot Foot Osteoarthropathy with Signs of Osteomyelitis

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Charcot arthropathy is an insidious condition affecting the lower limbs of diabetic patients. It is a complication of diabetic neuropathy resulting from subsequent Wallerian degeneration of the nerves. This complication may eventually lead to limb amputation and a poor patient prognosis if not diagnosed and treated successfully. Herein, we report the case of a 73-year-old female who presented with rapidly progressive bilateral Charcot foot over a 5-week period, necessitating an exostectomy on the mid foot, specifically on the cuboid bone and the navicular cuneiform joint. Her presentation with rapidly progressing foot ulcers on the plantar aspect prompted initial treatment based on osteomyelitis. The report will therefore serve as a useful guide on how to properly treat Charcot foot, which may present in an atypical manner.

Key words: Diabetic ulcers; Endocrinology; Infectious disease; Orthopaedic surgery

Introduction

Charcot foot osteoarthropathy is a rare, degenerative, and painless condition involving disease around joints caused by diabetes.[1] The condition affects 0.1% to 0.9% of people with diabetes and can occur bilaterally with an incidence rate of 30%.[2] In this case, the patient was diabetic and presented with symptoms of ulceration, inflammation, redness, and the area being warm to the touch. The case was unique at it presented with Charcot bilaterally with the development of osteomyelitis. Cases of Charcot foot complicated with osteomyelitis are 12 times more likely to result in amputation compared with no infection. However, this patient was able to avoid amputation by undergoing midfoot exostectomy and adopting a multitude of pre- and postoperative novel therapeutic modalities.[3,4]

Case Presentation

A 73-year-old female with a history of well-controlled Type II diabetes with daily 500 mg of oral metformin, hemoglobin A1c = 5.6%, neuropathy, and arthritis presented to the clinic with significant difficulty in walking and Achilles tightness with worsening bilateral foot ulcerations, for the past 2 years (Figures 1 and 2). The ulceration showed resistance to healing despite using a variety of off-loading modalities from orthotics to CAM boots, topical antibiotics, wound care ointments such as becaplermin, and total contact casting. X-ray imaging demonstrated severe rocker-bottom flatfoot with end-stage midfoot osteoarthropathy (Figure 3). Upon physical examination, a rigid rocker-bottom Charcot foot deformity has developed bilateral along with plantar foot ulcers. The Charcot flatfoot was chronic and was in an inactive phase. The patient had bilateral foot swelling with bilateral foot ulcerations. The ulceration in her right foot appeared hyper-granular with mild red peri-wound erythema, and an ulcer that probes towards the bone without cellulitis. The left foot had an ulceration, approximately the size of a quarter, also probing towards the bone with peripheral keratosis surrounding the wound without cellulitis.

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Fig. 1 Initial presenting ulcer on the right foot

Fig. 2 Initial presenting ulcer on the left foot

Doppler imaging was negative for DVT bilaterally inspecting patient's blood vessels. The patient's orthopaedic exam confirmed the diagnosis of non-active Charcot joint disease, stage C, with rocker-bottom flatfoot with palpable exostosis that has led to the ulceration. Wound culture of the midfoot prior to surgery detected proteus bacterial infection. Along

Fig. 3 Left foot X-ray pre-operation, showing Charcot destruction of the metatarsal cuneiform cuboid joint and navicular cuneiform joint with rocker bottom foot and collapse of mid-foot with a prominence of cuboid and cuneiform bones dislocated plantarly

with patient's elevated inflammatory markers CRP (7.82) and ERS (51), the ulcer probed towards the bone yielded an increased suspicion for potential underlying infection/osteomyelitis. For treatment, an exostectomy on the cuboid bone in the mid-foot was performed.

Preoperatively, the soft tissue infection was treated with a combination of IV 100 mg doxycycline and oral 2000/125 mg amoxicillin/clavulanic acid to prevent the proteus growth, coupled with off-loading orthotics and a single 15 g tube of topical 0.01% becaplermin 1¼ inches applied daily for continued wound care. This was followed by operative midfoot resection of exostosis bone overgrowth, as well as bilateral Achilles tendon lengthening. During the operation, an Integra graft, a product composed of collagen and glycosaminoglycans for dermal regeneration, was utilized to help the ulceration/skin deficit regrow new skin with minimal scarring. Postoperatively, the patient was placed in a short-leg fiberglass cast that was bivalved. The patient was then admitted postoperatively and kept on 30 mg enoxaparin administered every 12 h for 7 days to prevent blood clotting. Postoperatively, bone cultures were negative for osteomyelitis, and the patient was continued with a soft tissue course of antibiotics with 1500 mg IV vancomycin every 12 h and 2 g IV cefepime every 12 h by midline for 2 weeks. Due to the bilateral surgery, the patient was discharged to an extended

Fig. 4 Postoperative presentation of the left foot, showing the recovering ulcer and improvement of the wound

Fig. 5 Left foot X-ray post-operation

Fig. 6 Right foot X-ray presentation post-operation

care physical therapy/rehab facility. Two weeks post-surgery, the Achilles tendon showed significant healing, progress, and the patient appeared to be recovering well. The wounds from the incisions were closing without infection and the ulceration appeared to be 30%–60% healed bilaterally.

Fig. 7 Right foot X-ray pre-operation

Sutures were removed and an adaptive sterile Jones dressing, and a fiberglass posterior splint to control the swelling, were applied bilaterally. Five weeks post-operation, the patient made an excellent recovery of both of her feet, albeit at different healing rates. The swelling had completely diminished, and the ulcerations were essentially minimized (Figure 4). X-rays demonstrated clean resectioning of bone without any signs of infection. The patient was converted from posterior splints to CAM walkers with gradual progression of physical therapy. Both ulcers went on to completely heal. The patient was able to walk comfortably.

Discussion

This case demonstrated an atypical presentation of Charcot foot, as the condition occurred bilaterally with increased suspicion for osteomyelitis.[5] The differential diagnosis of Charcot foot is complex and is often misdiagnosed as cellulitis or acute soft-tissue infection. A systemic review of Charcot neuroarthropathy misdiagnosis reports an 48% misdiagnosis rate in diabetes type I and II patients.[6] We were able to diagnose Charcot arthropathy through the clinical picture, radiograph, and confirmed with the female patient's orthopaedic exam.

An infection within the Charcot region is associated with high levels of amputation and longer durations of antibiotic therapy and immobilization.[2] Upon presentation, the patient demonstrated an inability to heal the ulcerations despite aggressive attempts to off-load the area and treat it with local wound care. Surgical resection of the midfoot bone growth/exostosis was helpful in this case for two reasons. The resection of the sharp exostosis destressed and off-loaded the area, taking pressure off the skin and allowing the wound to heal without recurrence. In addition, resection of the bone allowed for a bone culture to help rule out osteomyelitis and determined the need and length of antibiotic therapy. Lengthening of the Achilles tendon helped destress the forces on the midfoot and minimize the potential for further breakdown and progression of the flatfoot.

This lengthening process starts off with a posterior skin incision made medial to the Achilles tendon. The tendon is then cut in either direction at the top or bottom of the slit, creating a "Z."[7]

It is also worth mentioning that patient-controlled diabetes played a significant role in the healing process as it limited the destructive effects of the disease on circulation.[8,9] For wound management, the patient had weekly dressing changes. The ulcerations were inspected and treated with Silvadene antibiotic cream. An adaptive sterile dressing followed by a fiberglass well-padded posterior splint after the wound was thoroughly cleansed in order to keep the tissue healthy and viable. The benefit of this specific dressing technique and postoperative management used by the surgeon is to achieve near-complete healing of both Charcot foot ulcers in a relatively quick turnaround time *vs* what is usually reported in the literature. For rehabilitation management, a CAM boot was utilized to offer support for the Achilles tendon upon walking. Immobilization of the foot in a full plantarflexion was also done to ensure all the muscles were being supported and recovering properly.[10]

Furthermore, the patient was advised to limit weight-bearing activities and use a walker to avoid injuries while the muscles were still recuperating. Upon completion of rehabilitation, both sides of the patient's foot were completely healed with no swelling. At 3-month follow-up, the ulcers showed complete remission without recurrence. The patient was subsequently permitted to walk as tolerable. Postoperative X-ray of the foot showed significant improvement with no sign of ulcers invading the bone (Figure 5). Compared to previous literature, our methods most closely resemble that of Pinzur *et al.*[11] who treated 49 neuropathic foot deformities with and without osteomyelitis. Their treatment involved debridement, exostectomy, and partial excision with boney stabilization and arthrodesis. The patients were postoperatively placed in long-term custom accommodative bracing. None of these patients required below-knee amputations and 48 of the 49 remained ambulatory after care.[11] A caveat to any Charcot foot case is that the test-of-cure cannot be determined until lack of clinical relapse is evidenced after ending antimicrobial treatment.[1] With long-term recurrence rates at 20%–30% as of 2013, treatment of Charcot requires continuous vigilance. The outcome achieved from this case is an important reference for future physicians treating bilateral Charcot foot deformity with resistant ulcerations. A multi-factorial process beginning with controlling blood sugar levels to specific sterile dressing techniques increased the success of the operation, shortened the duration of recovery, and improved the patient's long-term quality of life (Figures 6 and 7).

Conclusions

This case highlights the complex and multi-directional treatment as well as diagnosis of Charcot foot in a chronic diabetic patient. We report successful treatment of a complex bilateral case. The main treatment involved biopsy-tailored antibiotics, orthotics, bone resection, exostectomy, and Achilles tendon lengthening. Postoperatively, the patient was managed initially with splints and then later after graft removal, wound dressing with fiberglass splints.

Conflict of interest

The authors declare that they have no competing interest. None of the authors has any conflict of interest, financial or otherwise.

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