

Total Contact Cast and Amniotic Membrane Graft Treatment of Plantar Foot Ulcer Secondary to Charcot Deformity

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INTRODUCTION

The Charcot foot in patients with sensory deficit is a common problem that is still easily overlooked. The condition is limited to patients with peripheral neuropathy. Currently the most common cause for peripheral neuropathy is diabetes mellitus. However, Charcot foot has also been observed in individuals with syphilis and alcoholism. It is widely believed that the failure of medical professionals to recognize the early signs of Charcot is largely the main driving factor for the osseous destruction and gross deformity that follows with continued weightbearing. Such deformities and destruction can lead to ulcers and a high incidence of amputation (1).

The progression of Charcot foot is still not well understood. However, it has been established that the midfoot is generally the first aspect of the foot to be affected. In a study performed in 2013, it was revealed that the most degenerative changes occur primarily in the medial column. Such changes tend to occur before degeneration in the lateral column occurs, and can become so severe that if aggressive treatment is not provided, limb-threatening complications can quickly arise (2). It is important to note, that such treatments include conservative bracing, or surgical intervention. The purpose of bracing is to immobilize and offload the foot, particularly in the active stages of Charcot. Surgery is recommended for an already severe deformity and is used primarily to reconstruct alignment and stabilization of affected joints that cause the foot to collapse (3).

In this case study, a Charcot patient with a nonhealing ulcer was successfully treated with conservative bracing. Several offloading techniques were used, until finally the Total Contact Cast (TCC) proved to be the fastest-acting solution. It has been well-established that the TCC is an effective treatment for pressure plantar ulcers. The effectiveness of the TCC is so high, that in a study performed in 2015, it was proven that there were no significant differences in healing times when compared to surgical intervention (4).

CASE STUDY

The patient is a 77-year-old male with a history of Charcot foot. The patient had not been officially diagnosed with diabetes mellitus by his primary care doctor; however his hemoglobin A1C was high enough to be considered at least prediabetic. The past medical history includes hypertension, high cholesterol, and peripheral neuropathy. The patient had multiple foot surgeries and had an episode of gastric bleeding approximately 1 year ago that was almost fatal, but had now resolved. The patient presented in May 2015 for his routine diabetic foot evaluation and care. During the evaluation, a blister was present on the plantar aspect of the left foot. Radiographic evaluation did not reveal any abscess under the blister, or any infection present.

The Charcot condition was evident by the patient's left rocker bottom foot. The radiograph of the left foot showed bony degeneration and destruction of the midfoot with a collapsed and dislocated navicular and cuboid bone directly underneath the blister site. The blister did not appear infected, and once it was evacuated the drainage was clear and without any purulence or blood present. The foot was wrapped with clean and dry dressings and a CAM walker was dispensed. The patient was advised to continue using the CAM walker until further notice, and was also instructed to limit his walking and standing. Follow-up of the patient was performed on a weekly basis, and at 4 weeks, the blister was resolved, and instead a hyperkeratosis was noted in place. The hyperkeratosis was debrided and reduced without incident, the CAM walker was discharged and the patient was informed he could begin transitioning into a shoe with plastazote inserts.

The patient returned 10 days later, and upon examination the patient had developed an ulcer (Figure 1) on the plantar aspect of the left foot right under the cuboid, exactly where the blister and the hyperkeratosis were noted previously (Figure 2). The ulcer was approximately 5x4x4 cm and appeared to probe to bone. A wound culture was taken. The wound was dressed with wet-to-dry betadine and



Figure 1. Left foot ulcer.

was anchored with Kling and covered with Ace bandage. The patient was told to return to the CAM walker and was instructed to apply as little weight as possible to the left foot. He was also advised to limit walking and standing.

After 1 week, evaluation of the left foot revealed no change in the ulcer size. The wound culture was positive for heavy growth of *Pseudomonas Aeruginosa*. The patient was placed on Cipro (750 mg twice per day) for 2 weeks. The patient was advised to return to the clinic every 3 days. The wound continued to be dressed with wet-to-dry betadine and offloaded. After 2 weeks, another wound culture was taken and the results indicated heavy growth of Methicillin Resistant *Staphylococcus Aureus*. The patient was placed on Zyvox (linezolid) for 28 days. At the end of the 28 days, and after weekly debridements, another wound culture was taken and it indicated no growth present. At this point a Negative Pressure Wound Therapy VAC unit was ordered and put in place (Figure 3). In combination with the VAC therapy, Regranex (becaplermin) gel 0.01% was used. This combination stimulated the formation of granulation tissue in the area. After 5 weeks of VAC therapy, there was a plateau in the healing process and improvement of the wound. At this time, the decision was made to discontinue use of the VAC (Figure 4). The edema present in the affected lower extremity and infection were determined to be well-controlled. Throughout this process, the patient remained compliant with his restrictions on limited walking and standing.



Figure 2. Radiograph showing a dislocated cuboid at the site of the ulcer.



Figure 3. Appearance during wound VAC Therapy.



Figure 4. Appearance after wound VAC Therapy.

After the wound VAC therapy was finished, not much change in wound size was seen, although the wound bed appeared healthier. The possibility of surgery was discussed with the patient, which included removal of the bone, and/or a Charcot Reconstruction with the application of an external fixator. The patient did not wish to have surgery at this time. The patient also had other comorbidities that placed the patient at a high risk for surgery including a recent abdominal procedure after an episode of gastric bleeding. However, it was determined at this time that although the ulcer would continue to be treated conservatively, a more aggressive approach was needed to be taken. Different alternative routes of treatment were discussed with the patient. An amniotic graft with stem cells (Amnio Excel) was placed directly on the wound and a TCC-EZ total contact cast was placed (Figure 5). The patient was educated on the use and applications of total contact casts and was informed the treatment would take several weeks. The patient was told to return for evaluation and change of cast 3 days after the application of the first cast, and once a week after the first cast change.

After that first cast was changed the patient returned to the clinic in 1 week of the application and the change in the ulcer was noticeable (Figure 6). The size changed from 5x4x4 cm with tunneling to 2x2x0.5 cm without tunneling. The same treatment was continued for 3 weeks with visible improvement (Figure 7). At 3 weeks of treatment the patient left for vacation, where he admittedly walked too much. Upon his return, after almost 2 weeks of traveling, the ulcer had regressed (Figure 8). There were

some fibrotic changes and blister formation and the wound size was 2.5x2.5x0.5 cm. The patient was advised to once again restrict his walking and standing; and weekly TCC-EZ applications resumed. On a weekly basis, the ulcer continued to close (Figure 9). At 8 weeks, the ulcer was finally closed. A CROW boot was recommended and new custom-made accommodative orthotics were ordered.

CONCLUSION

This case study is a perfect example of how a conservative treatment can be used to successfully treat a plantar pressure ulcer in a patient with Charcot foot. The patient experienced rapid, exponential healing as soon as the first cast was applied. It is theorized that the stem cell graft used in conjunction with the TCC helped expedite the healing time. Although the exact mechanism through which the stem cells work is not clear, their potential in treating chronic cutaneous wounds is undeniable (5). The use of the TCC is an established and proven treatment for pressure wounds, and in this case it was highly effective. However, there is always a possibility of recurrence after TCC treatment has finished. It is important to note that when the pressure ulcer is caused by a bone deformity present, recurrence is always a possibility unless the deformity is surgically corrected. A study performed in 2015 demonstrated that the highest healing rate with the least recurrence was achieved through surgical correction of the Charcot-caused deformity followed by a period of offloading using a TCC (4).



Figure 5. Applying the TCC-EZ total contact cast.

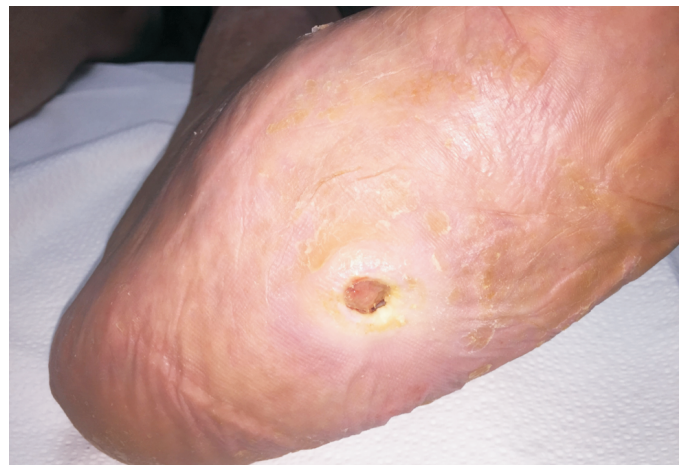


Figure 6. Appearance after 1 week of TCC-EZ and Amnio Excel graft.

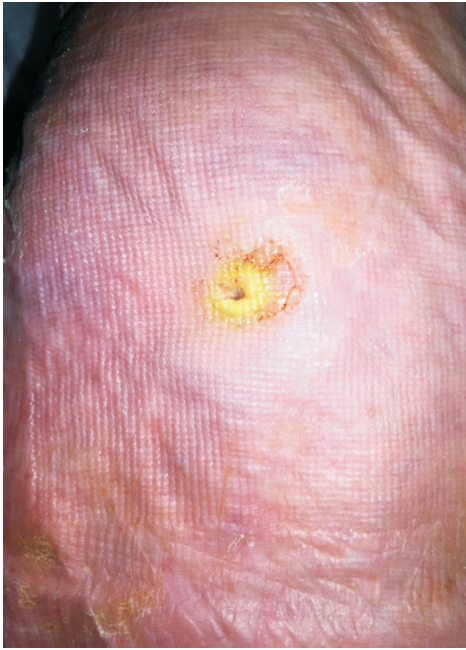


Figure 7. Appearance after 5 applications of TCC-EZ.



Figure 8. Appearance after 2 weeks vacation.



Figure 9. Appearance after 8 applications of TCC-EZ.

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