

# Offloading Diabetic Foot Ulcers with the Use of an All Fiberglass Total Contact Casting System

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## Introduction

The effectiveness of total contact casting in offloading the neuropathic foot is well established [1,2] yet is only utilized by a small percentage of wound care practitioners.[3] It is also well established that time-to-healing is directly related to limb salvage success.[4] To that end, it has been documented that the more total contact casting and other standard of care interventions become utilized, the less incidence there will be of lower extremity amputations and the lower the cost of care becomes for patients with diabetic foot ulcers.[5]

There are several different methods of total contact casting. The most common utilize either a combination of plaster and fiberglass or fiberglass only. It has been documented that the outcomes between the two methods are comparable.[6] That said, benefits to the all-fiberglass method include decreased drying time, less cast weight, less mess with application and better resistance to environmental moisture. Presented here are three case studies detailing the use of a commercially available, all-fiberglass, total contact cast (TCC) kit\*, modified with a built-in walking surface, for the treatment of diabetic foot ulcers.

## References

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\* TCC is a generic reference to Cutmed® Off-Loader Select, BSN medical inc., 5825 Carnegie Blvd., Charlotte, NC 28209-4633

## Methods and Materials

Three patients, who presented to the clinic with diabetic foot ulcers, were evaluated and worked up to ensure adequate blood flow and absence of clinical infection. Lower extremity edema was treated with compression. When all of these prerequisites had been satisfied, total contact casting was initiated.\* This was changed in two to three days and then weekly. The patients were given detailed instructions regarding total contact cast care and safety. Wounds were assessed on a weekly basis. Once wound closure was achieved the patients were transitioned into appropriate accommodative footwear.

## Results

Patient #1 had a 2 month h/o DFU, starting at 1.3cm length x 0.8cm width x 0.1cm depth, with complete closure within 3 weeks of TCC. Patient #2 had a 2½ month h/o DFU, starting at 0.9cm length x 0.7cm width x 0.4cm depth, with complete closure within 2 weeks of TCC. Patient #3 had a 3 week h/o DFU before starting TCC. Within 9½ weeks the wound went from 4.3cm length x 3.1cm width x 0.6cm depth to closure.

## Discussion

Each of these patients had significant barriers to healing. All had poorly controlled DM, absent protective sensation, poor compliance with offloading, histories of recurrent ulceration and, in two cases, previous amputation. One had severe Charcot deformity. Good local wound care, attempts at offloading and advanced dressings had been attempted without attaining wound closure.

Each of the patients had been treated with a plaster / fiberglass TCC, with built in walking surface, in the past. Patients either reported no difference in the way the cast felt or they preferred the all-fiberglass cast because it "felt lighter". No adverse events were encountered in these three cases.

Considering the possible loss of function, monetary cost and increasing risk of complications associated with delayed wound closure, the rapid resolution of difficult to heal, diabetic foot ulcers, while maintaining ambulation and mobility, is significant.

## Conclusion

Total contact casting utilizing an all-fiberglass kit\* produced favorable results in three members of a difficult to heal population.

## PATIENT 1

Patient #1 is a 47 year old male with a 2 month history of ulcer over the right, plantar 4th MTP.  
Past Medical History: Type II Diabetes, Hypertension, Hyperlipidemia. Surgical History: Right foot 3rd digit amputation 2011, Appendectomy 1999.

Day 1 - the wound measured 1.3cm length x 0.8cm width x 0.1cm depth, with an area of 1.04 sq cm and a volume of 0.104 cubic cm. It was debrided and dressed with cadexomer iodine and dry dressing. A tubular, elastic bandage was applied to manage lower leg edema. A fiberglass total contact cast with built in walking surface (TCC) was applied.

Day 7 - the wound measured 1.3cm length x 1cm width x 0.2cm depth, with an area of 1.3 sq cm and a volume of 0.26 cubic cm. The wound was debrided and dressed cadexomer iodine and dry dressing. A tubular, elastic bandage was applied to manage lower leg edema. A TCC was applied.\*

Day 21 - the wound was 100% epithelialized. The patient was transitioned to extra depth shoes with custom molded inserts.



## PATIENT 2

Patient #2 is a 32 year old male with a 2.5 month history of ulcer over the right great toe.  
Past Medical History: Type II diabetes, poorly controlled hypertension, asthma, shingles. Surgical History: I&D of right foot abscess in 2011.

Day 1 - the wound measured 0.9cm length x 0.7cm width x 0.4cm depth, with an area of 0.63 sq cm and a volume of 0.252 cubic cm. Wound edges were thickened and rolled. There was significant peri-wound callus. Right DP and PT pulses were biphasic. Left DP pulse was biphasic and PT triphasic. There was no clinical appearance of infection. Protective sensation noted to be absent. The wound was sharply debrided and then dressed with a cadexomer iodine topical and dry dressing. A tubular, elastic bandage was applied to manage lower leg edema. A TCC was applied.\*

Day 10 - the wound measured 0.8cm length x 0.6cm width x 0.3cm depth; with an area of 0.48 sq cm and a volume of 0.144 cubic cm. The same treatment was continued.

Day 17 - the wound had completely epithelialized.



## PATIENT 3

Patient #3 is a 70 year old male, 6'2" and weighed 340 lbs. He presented to the clinic with an eight day history of bruising and ulcer of the left foot with known previous diabetic foot ulcers.  
Past Medical History: hyperlipidemia, hypertension, arthritis, type II diabetes, Charcot foot neuropathy, obesity and arthritis. Surgical History: left 5th toe amputation - 1/1/2006.

Day 1 - The patient presented a bruised fluctuant area on his left, plantar mid-foot. This was unroofed and sharply debrided to reveal a wound that measured 5cm length x 3.5cm width, with an area of 17.5 sq cm. Undermining was noted from 10:00 to 2:00 with a maximum distance of 1.2cm. Bilateral DP and PT pulses were biphasic. Protective sensation was noted to be absent. A culture was taken and doxycycline 300 mg 3x/day was started.

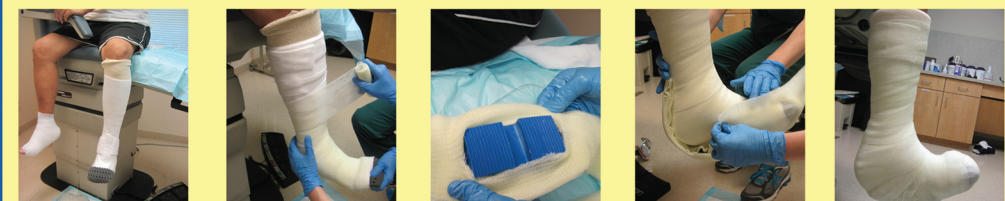
Day 17 - the wound measured 4.3cm length x 3.1cm width x 0.6cm depth, with an area of 13.33 sq cm and a volume of 7.998 cubic cm. No tunneling or undermining noted. The wound was dressed with collagenase ointment and moistened PVA foam dressing. A tubular, elastic bandage was applied to manage lower leg edema. A TCC was applied\*. This was changed 3 days later and the following week.

Day 41 - the wound measured 3.5cm length x 2.2cm width x 0.2cm depth, with an area of 7.7 sq cm and a volume of 1.54 cubic cm. Hypergranulation was noted in the wound base and sharply debrided. A bi-layered skin equivalent was applied and fixed in place and was dressed with a soft silicone contact layer, cadexomer iodine and a dry dressing. Tubular, elastic bandage and TCC were re-applied. TCC was changed weekly. Bi-layered skin equivalent was reapplied on Day 45.

Day 79 - the wound was 100% epithelialized. Total contact casting was continued for two additional weeks to maximize epithelial integrity and the patient was then transitioned into custom molded shoes and inserts.



## APPLICATION



The method of TCC application: A thick, Terry cloth stockinette was applied over the entire lower leg and folded back over the top of the foot. 1/8" adhesive backed felt was applied to the anterior shin and malleoli. ¼" adhesive backed foam was folded over the toes lengthwise and the edges trimmed. Two to three layers of cotton padding were applied from the proximal portion of the ¼" foam to approximately 2" below the tibial tubercle, with two extra layers at the proximal end to ensure a soft cast edge. An assistant was utilized to hold the patient's ankle and foot in a neutral position by pressing up along the plantar surface of the forefoot, just distal to the MTP joints. Two layers of fiberglass were applied from the base of the toes to just below the edge of the cast padding, in a spiral fashion. The stockinette and tubular elastic bandage were folded over the edge of the fiberglass. A final check and adjustment of foot and ankle angles was completed. This final positioning was held by the casting assistant as noted. Two posterior splints were made by fan folding fiberglass rolls. One posterior splint was cut to allow insertion of a rubber walking surface. The other splint was applied first, covering the toe area, the plantar surface, the heel and lower posterior calf area. The end of this was used to fill any void area on the plantar surface. The splint containing the walking surface was applied over the same area, positioning the walking surface in the plantar, mid-foot area, just distal to the heel. A fiberglass roll was wrapped from the side of the foot area, around the toes, around the posterior heel and back to the toe area. It was then brought around in a spiral fashion, anchoring the distal, center notch and proximal edge of the walking surface and continuing proximally to just below the edge of the cast. The walking surface was inspected to ensure neutral positioning of surface in relation to the leg.