

Treating a case of diabetic stump ulceration after Chopart's amputation with total contact casting

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ABSTRACT

Chopart's amputation is a limb length-preserving amputation that retains function but often suffers from stump ulcerations. We report a case of a 68-year-old male patient with poorly controlled type 2 diabetes mellitus and peripheral arterial disease who underwent left Chopart's amputation, presenting subsequently with nonhealing ulcers at the Chopart stump and heel for >1 year. Total contact casting was initiated, resulting in rapid wound healing without further interventions. This case highlights total contact casting's effectiveness in managing ulcerations post-Chopart's amputation, potentially preventing revision amputations, and extending its usefulness to complex foot anatomy in patients with diabetes and peripheral arterial disease. (*J Vasc Surg Cases Innov Tech* 2024;10:101589.)

Keywords: Post-amputation ulceration; Total contact casting; Wound healing

Diabetic foot ulcers (DFUs) pose a significant challenge in the management of diabetes, with a lifetime risk of DFUs of 19% to 34%.¹ More than one-half of DFUs go on to develop infection,² and despite advances in care,³ 20% of moderate to severe diabetic foot infections result in amputation.⁴

When indicated, the lowest level of amputation is preferred, ranging from partial toe amputation to below-knee amputation (BKA).³ Chopart's amputation, with disarticulation through the talonavicular and calcaneocuboid joints, is a viable alternative to BKA. It preserves limb length and enables direct loading on the residual limb, improving patient quality of life.^{5,6} However, wound healing complications occur in many patients undergoing Chopart's amputation. The underlying pathomechanics cause an equinovarus contracture, predisposing patients to lateral calcaneal and anterolateral stump ulcerations.^{7,8} These pathomechanics contribute to approximately 46% of conventional Chopart's amputations experiencing failed wound healing.⁹

Diabetes, and its associated neuropathic and angiopathic changes, contribute to failed healing.¹⁰ Stump ulceration precipitates infection, necessitates prosthetic

discontinuation for offloading, and leads to more extensive procedures, often BKA.^{11,12}

Offloading is central to managing neuropathic ulcerations, with total contact casting (TCC) as the gold standard. TCC involves a rigid cast extending from the foot to tibial tuberosity, with soft foam padding the forefoot and ulceration. TCC promotes wound healing by offloading the forefoot and distributing pressure off the foot into the TCC itself (Fig 1).^{13,14} Despite established efficacy in decreasing infection and enhancing DFU healing, TCC remains underused.^{15,16} TCC is also effective in healing stump ulcerations in patients with diabetes.¹⁷ However, this study investigated toe and transmetatarsal amputations in patients without evidence of ischemia. Here, we present the use of TCC in a patient with diabetes and peripheral arterial disease (PAD) with long-standing non-healing ulcerations after Chopart's amputation.

CASE REPORT

A 68-year-old male patient with a history of poorly controlled type 2 diabetes and PAD presented to the wound care clinic with ulcerations on his left posterior heel and Chopart's stump as a referral from an external vascular surgery practice. He was 1 year post right BKA and left single-stage Chopart's amputation owing to bilateral lower extremity (LE) gangrene. He had undergone left superficial femoral artery angioplasty, left posterior tibial (PT) to medial plantar artery bypass with saphenous vein, and left PT artery angioplasty. Per recent vascular surgery LE duplex studies, his PT artery bypass graft has been occluded since before his amputation. They determined no further vascular interventions were possible and deemed further vascular studies unnecessary. Therefore, we did not obtain any additional vascular studies and our examination noted a non-palpable PT artery.

The patient reported that the stump ulceration never healed after surgery. He was relying on his left LE stump and a wheelchair for ambulation. Persistent ulceration resulted from continued weight bearing in the context of neuropathy, impaired perfusion, and unfavorable pathomechanics after

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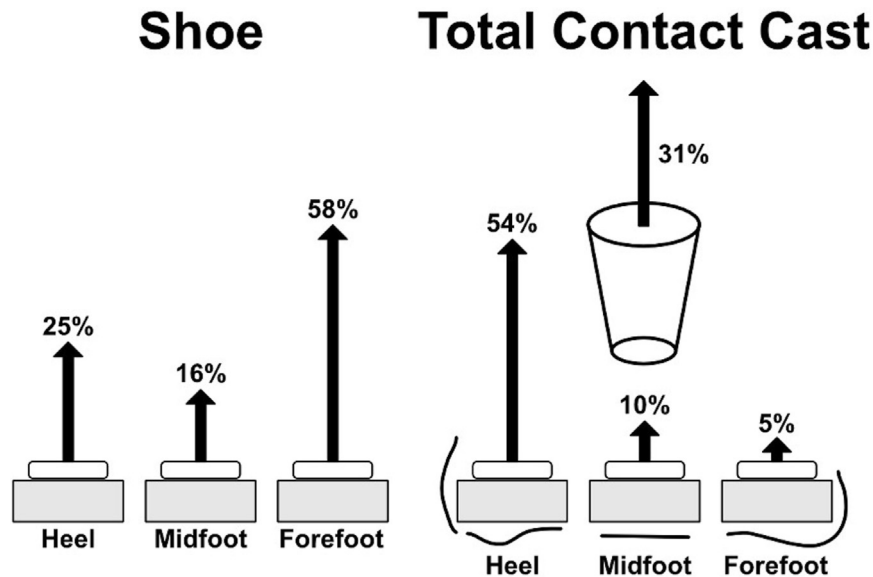


Fig 1. Pressure force reduction by total contact casting (TCC) in percentage of total force on foot. Force vector schematic depicting the total force distribution across the foot with TCC compared with a typical shoe. A total contact cast effectively distributes pressure off the forefoot and into the cast, significantly offloading the foot and improving wound healing. Although force distribution has not been studied in patients with partial foot amputations, it can be assumed that the stump ulceration, analogous to the forefoot, will be substantially offloaded.

Chopart's amputation. The patient emphasized his concerns about becoming a double amputee.

On physical examination, his stump ulceration was nontender with decreased sensation. There was a cluster of three nonpurulent ulcers over the anterodorsal stump, each <1 cm in greatest dimension, with exposed spicules of bone (Fig 2). There was also a superficial, full-thickness ulceration on the posterior left heel, measuring 3.5 × 3.0 × 0.2 cm (Fig 3). The patient had 3+ pitting edema of the left leg. Counseling was provided on leg elevation. Topical calcium alginate with silver and ACE bandage compression were applied. Given the exposed bone, clinical osteomyelitis was diagnosed, and sterile debridement was indicated. Obtaining bone films, although typically indicated, would not have changed management.

One week later, sterile Rongeur debridement of the stump ulceration was performed to remove the exposed bone. A left LE TCC was then applied by a trained physical therapist. TCC with modifications was used given the Chopart anatomy, with methodology described elsewhere.¹⁸ TCC took <1 hour to apply and used calcium alginate with silver as topical therapy. The patient was allowed limited activities, including weight-bearing within his home and ambulating to medical appointments, thus decreasing repetitive trauma.

Subsequent visits occurred every 2 to 4 weeks with consistent improvement noted. After 2 weeks, the TCC was bivalved to form a removable total contact walking splint. Removability allows for greater limb accessibility, scar maturation, and preparation for transition to prescription footwear. Four total Rongeur debridements were performed to address the exposed bone. The splint was changed every 2 to 4 weeks. The ulcers closed

nine months after the initial presentation (Figs 4 and 5). He was transitioned to an Arizona brace for long-term offloading to prevent recurrence, as described elsewhere.¹⁹ There was no reported recurrence at 1 year. No antibiotics, skin grafts, or surgical interventions were required. The patient consented to this report.

DISCUSSION

This case highlights the devastating impact of DFUs and the wound healing complications common after Chopart's amputation. Our patient, a 68-year-old man with a history of poorly controlled diabetes, PAD, and multiple revascularization attempts, faced a heightened risk for stump ulceration and revision to BKA. Despite having a nonhealing stump ulceration for 1 year after surgery, we observed immediate improvement after TCC and serial bone debridement. Having already had a contralateral BKA, TCC saved him from becoming a double amputee.

Previous research has established the efficacy of TCC in promoting wound healing, both in DFUs and pressure ulcerations in nonischemic patients with diabetes after toe and transmetatarsal amputations.¹⁵⁻¹⁷ Our case extends the use of TCC by applying TCC in complex, nonhealing foot wounds, including both heel and stump ulcerations, in the setting of diabetic nephropathy, PAD, and prior Chopart's amputation. The success of TCC in stump ulcerations with complex foot anatomy can likely be extended to other LE amputations, including Lisfranc's and Syme's amputations.



Fig 2. Anterodorsal stump ulcerations at presentation, each with exposed speculations of bone.



Fig 3. Posterior heel ulcerations at presentation, measuring 3.5 × 3.0 cm.



Fig 4. Anterodorsal stump ulceration nine months after initiation of total contact casting (TCC), fully healed.

Nonhealing ulcerations in patients with PAD and diabetes often necessitate revision.^{12,20} However, the literature documents alternative approaches, including a case report demonstrating the use of artificial dermis and skin grafting to heal ischemic ulceration after Chopart's amputation.²¹ Another report applied a modified Bohler walking iron cast, similar to TCC with the purported benefit of improved heel offloading, in a patient with diabetes, heel ulceration, and prior Chopart's amputation.²²⁻²⁴ However, another study found that adding foam padding over heel ulcerations with TCC improves heel offloading and promotes successful healing.²⁵ Before TCC, a patient's vascular status must be assessed, which may include laser Doppler or transcutaneous oximetry. However, in this patient referred from an outside vascular surgeon without further vascular interventions planned, a nonhealing wound with exposed bone was

deemed a greater risk than delaying treatment to obtain further studies. Although remaining a single case, this report highlights the potential of TCC in promoting the healing of posterior heel and anterodorsal stump



Fig 5. Posterior heel ulceration nine months after initiation of total contact casting (TCC), fully healed.

ulcerations in a patient with diabetes and PAD after Chopart's amputation.

CONCLUSIONS

TCC, the gold standard for offloading, can prevent the need for higher-level amputations. Although time consuming, TCC has strong outcomes and is estimated to cost 50% of comparable treatments and 25% of amputation.¹⁶ All providers can learn TCC application and management techniques with continuing medical education courses. This report highlights the potential for TCC as the primary intervention for healing stump ulcerations and avoiding postamputation revisions and complications. Further investigation is needed to determine the benefits and limitations of TCC in treating stump ulcerations, particularly in amputations that preserve ambulatory function, such as Lisfranc's, Chopart's, and Syme's.

DISCLOSURES

None.

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