



ARIZONA COLLEGE OF PODIATRIC MEDICINE



Non-Healing Ulceration of the Lower Extremity: A Case Report and Review of the Literature

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INTRODUCTION

Diabetes-related foot disease is among the most severe and costly complications of diabetes, contributing significantly to morbidity, loss of mobility, and risk of lower-extremity amputation worldwide. Chronic, non-healing ulcers often develop through a combination of peripheral neuropathy, peripheral arterial disease (PAD), and impaired wound healing mechanisms. The 2023 International Working Group on the Diabetic Foot (IWGDF) guidelines emphasize the importance of a multidisciplinary approach that includes prompt vascular assessment, infection control, pressure offloading, and consideration of adjunctive therapies when standard management fails to achieve healing. However, ulcer resolution remains particularly challenging in patients with multiple comorbidities or impaired tissue perfusion. Emerging modalities such as topical oxygen therapy (TOT) and amniotic tissue matrix grafts have demonstrated potential to enhance healing in complex diabetic and ischemic ulcers when integrated into comprehensive wound care and revascularization strategies.¹

CASE STUDY

A 56-year-old paraplegic woman with type 1 diabetes, PAD, coronary artery disease, stroke, and other comorbidities presented with a chronic left heel ulcer unresponsive to standard wound care. Tissue biopsy showed acute inflammation without malignancy or infection, and MRI suggested possible early osteomyelitis. Subsequent bone pathology was negative for inflammation or necrosis, and no bacterial growth was present on bone culture. A brief course of oral antibiotics was initiated for possible bacterial superinfection. Vascular studies demonstrated impaired perfusion, prompting left lower extremity angioplasty, which improved circulation. Adjunctive TOT was initiated at home using a wound isolation bag system delivering pressurized oxygen (≈ 800 mmHg) for 90 minutes, 5 days per week, over 20 weeks. The patient also received weekly amniotic tissue matrix grafts. After 5 months of combined therapy, complete wound closure was achieved.

FIGURE 1: Wound Progression



FIGURE 2: Single Use Chamber and Hyper-Box Controller (Advanced Oxygen Therapy Inc. Hyper-Box System)⁶



DISCUSSION

Chronic, non-healing diabetic foot ulcers (DFUs) present significant clinical challenges, particularly in patients with peripheral arterial disease (PAD), neuropathy, and diabetes mellitus. In this case, persistent ulceration despite standard wound care prompted a multimodal approach involving revascularization, topical oxygen therapy (TOT), and amniotic tissue grafting. Oxygen-based adjunctive therapies have been shown to improve wound healing by enhancing angiogenesis, collagen synthesis, and fibroblast proliferation. Hyperbaric oxygen therapy (HBOT) remains the most extensively studied modality with significantly reduced major amputation rates in patients with DFUs complicated by PAD (10.7% vs. 26.0%). TOT offers a practical, localized alternative that avoids systemic side effects with improved healing trajectories across multiple studies and superior wound closure rates with pressurized topical oxygen (82.4%) compared to standard moist dressings (45.5%).² Infection management is another cornerstone of DFU care. Deep tissue cultures yield more accurate pathogen identification than superficial swabs, particularly in higher-grade wounds supporting the use of bone biopsy in this case to rule out osteomyelitis.³ Overall, this patient's complete wound closure following angioplasty, topical oxygen therapy, and biologic grafting supports evidence that combining vascular optimization with oxygen-based adjunctive modalities can accelerate healing and reduce complications in complex ischemic diabetic ulcers.

CONCLUSION

This case demonstrates that combining vascular optimization, TOT, and amniotic tissue grafting can effectively promote healing in chronic, ischemic diabetic foot ulcers. Revascularization improved perfusion, while adjunctive oxygen therapy and biologic treatment enhanced local tissue repair. Consistent with current evidence, a multidisciplinary, evidence-based approach can accelerate healing, reduce infection risk, and help prevent amputation in patients with complex diabetic wounds.^{2, 3, 4, 5}

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