

# CYCLICAL PRESSURIZED TOPICAL OXYGEN THERAPY FOR THE TREATMENT OF LATE EFFECT RADIATION WOUNDS

Radiation Wounds

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## INTRODUCTION

Impaired wound healing is a challenging problem in patients treated with radiation therapy. Radiation damages the cell's DNA and ability to replicate and function normally, increases oxidative stress and destroys small vessels, leading to a prolonged inflammatory response, fibrosis and ischemia. Complete excision and pedicled or free flap reconstruction is thought to be the most successful treatment; however, it requires access to surgeons with appropriate experience/skill and often requires multiple-stage surgeries and prolonged hospitalization and is associated with high complication rates and significant donor site morbidity.<sup>1</sup> For some patients, a surgical approach may not be appropriate or feasible.

## OBJECTIVE

Topical oxygen therapies, delivered in an outpatient or home setting, have been shown to increase oxygen levels in wound tissues, upregulate VEGF, increase angiogenesis, accelerate wound closure and improve collagen synthesis and remodeling.<sup>2-6</sup> Cyclical pressurized topical oxygen therapy (TWO2)\* has the added benefits of: 1. providing O<sub>2</sub> under pressure, which delivers a greater concentration of oxygen to the tissue and 2. cyclical, non-contact compression, alternating between 8.5 and 38.5 mmHg, which decreases edema and improves local perfusion.

## METHODOLOGY

This case series describes the use of TWO2 for the treatment of late-effect radiation wounds in two medically complex patients with multiple comorbidities and limited access to healthcare services. Case one involves a 76-year-old female, with a five-year history of recurrent right, medial ankle ulceration. Case 2 involves a 78-year-old male with a left, anterolateral leg ulcer, present for 7 months. Prior to initiation of TWO2, both patients had been treated with standard of care for at least two months, including debridement, edema management, moist wound dressings and appropriate medical management, with little wound improvement.

## RESULTS/ FINDINGS

Percent volume reduction was 61% at 12 weeks and 92% at 24 weeks for patient 1 and 50% at 12 weeks and 100% at 24 weeks for patient 2. Wound exudate and inflammation were reduced with treatment and both patients reported decreased pain. It is interesting to note that the trajectory of wound volume reduction accelerated around week 8 for both wounds.

## RELATED LITERATURE

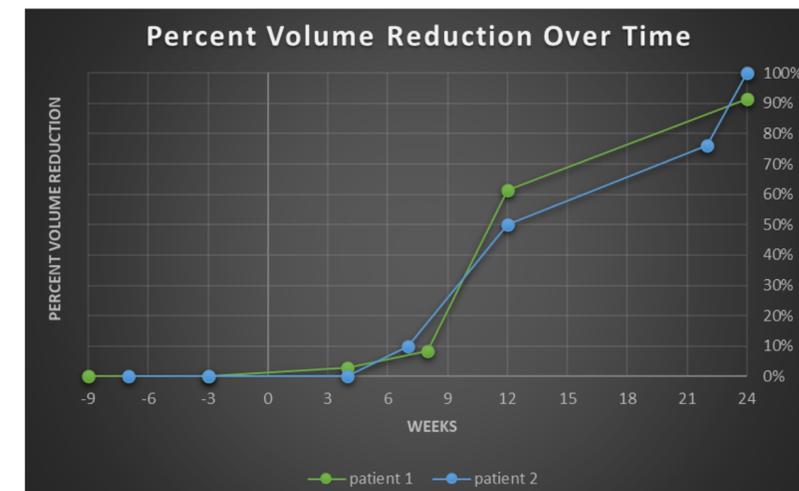
1. Fujioka M. Surgical Reconstruction of Radiation Injuries. *Adv Wound Care (New Rochelle)*. 2014;3(1):25-37. doi:10.1089/wound.2012.0405
  2. Fries RB, Wallace WA, Roy S, et al. Dermal excisional wound healing in pigs following treatment with topically applied pure oxygen. *Mutation Research - Fundamental and Molecular Mechanisms of Mutagenesis*. 2005;579(1-2):172-181. doi:10.1016/J.MRFMMM.2005.02.023
  3. Gottrup F, Dissemond J, Baines C, et al. Use of oxygen therapies in wound healing. *J Wound Care*. 2017;26:S1-S42. doi:10.12968/JOWC.2017.26.SUP5.S1
  4. Yu J, Lu S, McLaren AM, Perry JA, Cross KM. Topical oxygen therapy results in complete wound healing in diabetic foot ulcers. *Wound Repair and Regeneration*. 2016;24(6):1066-1072. doi:10.1111/wrr.12490
  5. Leslie CA, Sapico FL, Ginunas VJ, Adkins RH. Randomized controlled trial of topical hyperbaric oxygen for treatment of diabetic foot ulcers. *Diabetes Care*. 1988;11(2):111-115. doi:10.2337/DIACARE.11.2.111
  6. Gordillo GM, Roy S, Khanna S, et al. Topical oxygen therapy induces vascular endothelial growth factor expression and improves closure of clinically presented chronic wounds. *Clin Exp Pharmacol Physiol*. 2008;35(8):957-964. doi:10.1111/j.1440-1681.2008.04934.x
- \*TWO2 (AOTI Inc. Oceanside, CA)



1. Patient 1 at week 24



2. Patient 2 at week 24



Week 0 represents start of TWO2 therapy

## CONCLUSION

TWO2 was effective in decreasing pain, improving wound bed vascularity and achieving significant wound size reduction, in two medically complex patients with late-effect soft tissue radiation injury, who were refractory to standard of care and had few other options for treatment.