

A Closer Look At Continuous Diffusion Of Oxygen Therapy For A Chronic, Painful Venous Leg Ulcer

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The authors detail the diagnostic workup and treatment of a patient with a history of venous insufficiency and a large, painful non-healing ulcer, and the use of continuous diffusion of oxygen therapy to facilitate healing.



The study involves a 53-year-old female who presented to the clinic complaining of a large, painful, non-healing wound on the medial aspect of the right ankle that had been present for five months.

The patient's medical history was pertinent for both venous insufficiency with bilateral ulcers as well as obesity. The patient's pain ranged from 3/10 to 8/10 on the Visual Analog Scale (VAS) throughout the five-month duration of the ulcer. Narcotic pain medications alleviated the pain. The patient reported prior treatment over the last 150 days that included four-layer compression (Profore, Smith and Nephew), cadexomer matrix dressing (Iodosorb, Smith and Nephew), collagenase (Santyl, Smith and Nephew) and silver nitrate. The patient has no known drug allergies.

The initial lower extremity physical exam revealed lower extremity hyperpigmentation and hemosiderin deposition in the bilateral gaiter area. Full thickness ulceration to the level of the dermis was present in the medial right ankle at the level of the medial malleolus. The ulcer measured 6.7 cm x 5.3 cm. Hypergranulation tissue was present at the wound base. The wound was well circumscribed and irregularly shaped with erythematous borders. Active serous drainage was present. There was no odor, no purulence and no gross signs of infection.



The patient had diffuse non-pitting edema in the bilateral lower extremity. The dorsalis pedis/posterior tibial pulses were weakly palpable secondary to the edema but biphasic via Doppler. Her left toe brachial index (TBI) was 0.84 and the right TBI was 0.69. The skin temperature was warm to cool, proximal to distal bilaterally. The capillary fill time was less than 5 seconds in toes one through five bilaterally. Her digital hair growth was absent. An ultrasound test of the right lower extremity revealed an incompetent great saphenous vein at the saphenofemoral junctions both above and below the knee, and incompetence of the small saphenous vein including the saphenopopliteal junction.

The neurological examination revealed the patient's epicritic sensation to be grossly intact. She ambulated without assistance with lower extremity muscle strength and pain-free pedal/ankle range of motion within normal limits.

How Continuous Diffusion Of Oxygen Therapy Can Have An Impact



We selected continuous diffusion of oxygen therapy as a treatment modality due to the painful nature and the chronicity of the patient's wound. The patient received TransCu O₂ (EO₂ Concepts) at 10 mL/hr for her wound followed by a four-layer compression dressing (Profore, Smith and Nephew). Use of an impregnated absorbent dressing (Mesalt, Molnlycke Health Care) controlled hypergranulation for two weeks.

The patient's ulcer pain ranged from 3/10 to 8/10 on the VAS throughout the five-month duration of the ulcer, requiring the patient to take pain medications when needed. The patient reported a pain level of only 2/10 after 20 days of continuous diffusion of oxygen treatment and did not need additional pain medication at that time. Wound measurement at the initiation of therapy was 6.7 cm x 5.3 cm with hypergranulation (see photo 1). We temporarily discontinued diffusion of oxygen at the 20-day mark as the patient was leaving town for a holiday. She returned to the clinic six days later (day 26 since beginning continuous therapy) and related 10/10 pain and difficulty sleeping. Continuous diffusion of oxygen treatment resumed at this point.



Three days after restarting the continuous diffusion of oxygen therapy, the patient demonstrated adequate pain control and discontinued taking narcotic pain medications. Photo 2 demonstrates the wound at day 29. The wound measurements taken at day 54 of treatment were 3.6 cm x 1.3 cm with mild hypergranulation (see photo 3). Complete wound closure occurred in 79 days with 100 percent epithelialization over the hypergranulation tissue (see photo 4).

In Conclusion

The treatment and management of chronic wounds can often be challenging. Oxygen is necessary for both cellular metabolism and host defense. Physicians have utilized various forms of oxygen therapy to aid in the healing of wounds. The three major oxygen-based therapies that are in clinical use include hyperbaric oxygen therapy (HBOT), topical oxygen and continuous diffusion oxygen therapy.

Continuous diffusion of oxygen is a newer therapy that is capable of delivering continuous

oxygen without pressure and at a low flow rate. The low flow means it is unnecessary to have a humidifying adjunct to prevent desiccation of the wound. In addition, this device does not compromise the normal dressings and patient mobility.

This case study demonstrates a successful use of continuous diffusion of oxygen in healing a chronic, painful, large wound. However, randomized controlled trials are needed to assess the effectiveness of the therapy.

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