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CASE STUDY

Sequential Use of Hyperbaric Oxygen, Synthetic Skin Substitute and Skin Grafting in the Treatment of a Refractory Vasculitic Ulcer

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KEYWORDS:
Vasculitis;
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Abstract Cutaneous leukocytoclastic vasculitis (CLCV) is a disorder characterized by the inflammation of the small vessels of the skin. CLCV may cause recurrent, drug-resistant, non-healing ulcers. Herein, we present a patient with a recalcitrant ulcer caused by CLCV, who was successfully treated with hyperbaric oxygen therapy and skin grafting. There is not any particular therapy/product that will heal all type of wounds. We can achieve better results provided that wound care products and advanced treatments are used at the right time.
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Introduction

Cutaneous leukocytoclastic vasculitis (CLCV) is a disorder characterized by the inflammation of the small vessels of the skin.[1] While etiology in 40–60% of patients remains idiopathic, multiple factors including drugs, infections, systemic inflammatory diseases and malignancy have been associated with CLCV.[2] The majority of skin lesions manifest as self-limited palpable purpuric lesions or deep ulcerations. Less frequently, however, recurrent, drug-resistant, non-healing ulcers may occur.[3,4]

Herein, we present a patient with a recalcitrant ulcer caused by CLCV, who was successfully treated with hyperbaric oxygen therapy (HBOT) and skin grafting.

Case Report

A 38-year-old female presented with a painful, necrotic ulcer of 5 months duration on her right ankle. The ulcer was 5 × 4 cm in size, covered with black and yellow necrosis and surrounded with erythema (Fig. 1). The patient had a history of recurrent ulcers at the same localization for the past 14 years. Punch biopsy of the lesion was in accordance with leukocytoclastic vasculitis. Although she received steroid therapy and local wound care for 5 months the ulcer got worse. She was referred to our department for HBOT.

At admission; pedal pulses were palpable and venous insufficiency was excluded by normal duplex scanning of the lower extremity veins. Microbiologic culture grew *Pseudomonas aeruginosa* and levofloxacin 500 mg/day was prescribed. Daily wound care involved sharp debridement of the necrotic tissues. HBOT was carried out at 2.4 atm absolute (ATA) for 90 min, interspersed with two 5-min air breaks, once daily, 5 days a week.

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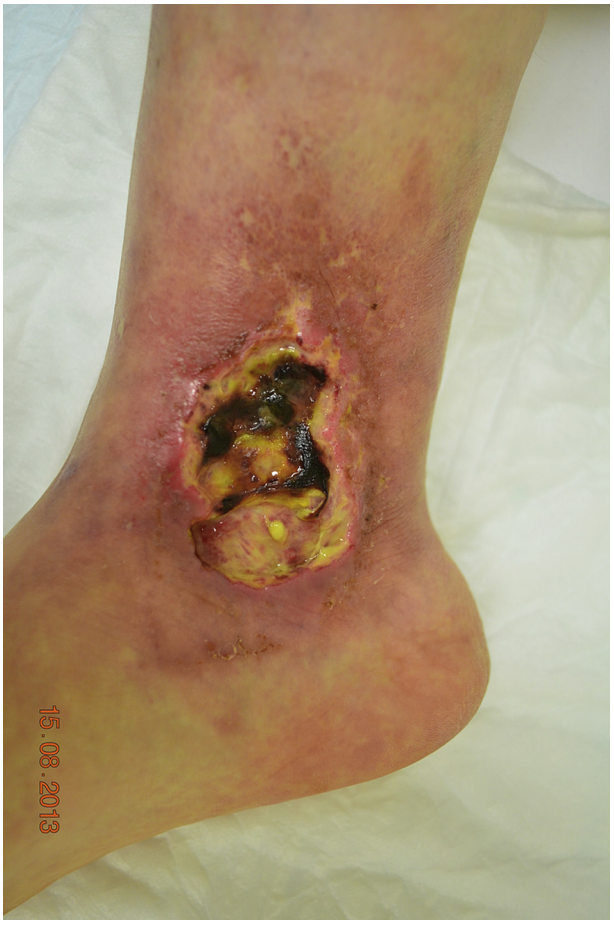

Figure 1 At admission, the ulcer was 5 × 4 cm in size, covered with black and yellow necrosis and surrounded with erythema.

After 4 weeks, infection subsided and the wound base was free of necrotic tissues (Fig. 2). A synthetic skin substitute (Epigard®) was applied over the wound and changed every 3 days. After 2 weeks treatment she received skin grafting. Overall, the patient received a total of 27 HBO treatments. Follow up visit at 6 weeks of skin grafting showed complete wound closure (Fig. 3) and no recurrence was noted at 8 months follow-up.

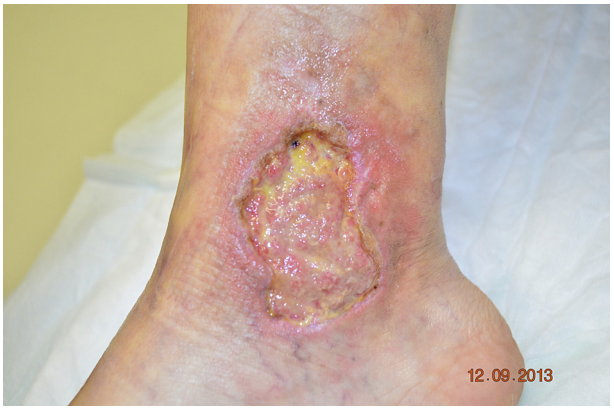

Figure 2 After 4 weeks (18 HBOT sessions), infection subsided and the wound base was free of necrotic tissue.

Discussion

CLCV may, although rarely, cause recurrent, drug-resistant, non-healing ulcers.[3,4] Hypoxia is an important aspect that contributes to chronicity of non-healing vasculitic ulcers.[3] HBOT, which involves the inhalation of ~100% oxygen at a pressure greater than 1 ATA[5] increases the amount of oxygen dissolved in blood and thereby improves tissue oxygenation. By restoring tissue oxygenation, HBOT enhances fibroblast proliferation, collagen synthesis and maturation, growth factor synthesis and bacterial killing capacity of neutrophils.[5] Others also used HBOT for the treatment of vasculitic ulcers including CLCV.[3,6] Efrati et al reported complete wound closure in 80% of patients with non-healing vasculitic ulcers after 35.4 ± 13.4 HBOT sessions.[3] Transcutaneous partial pressure of oxygen ($tcpO_2$), measured at the periwound skin of these patients, confirmed hypoxic nature of the non-healing vasculitic ulcers. $TcpO_2$ was 23.2 ± 18 mm Hg at room air and increased to 443.2 ± 223.5 mm Hg during HBOT at 2 ATA. Daily prednisone dose and ulcer related pain was

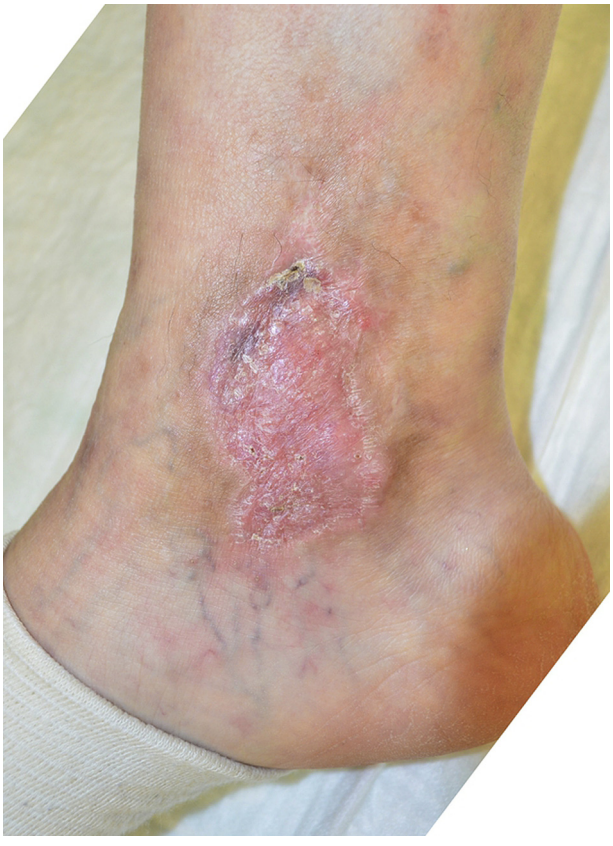

Figure 3 Follow up visit after 6 weeks of skin grafting showed complete wound closure.

significantly reduced with HBOT.[3] Similarly, ulcer related pain was reduced in our patient during the course of HBOT.

Ankle brachial index (ABI), arterial Doppler ultrasonography and tcpO_2 are useful measurements to evaluate the arterial supply and tissue oxygenation in patients with chronic wounds. Since our patient's lower extremity arterial pulses were palpable, the vascular surgeon did not consider arterial Doppler ultrasonography. We did not also perform ABI and tcpO_2 measurements.

Epigard® is a synthetic skin substitute, which is used for temporary coverage of open wounds.[7] The air permeable top surface keeps bacteria out and exudate in, while underside made of porous polyurethane matrix absorbs wound exudate and adheres to the wound bed. When Epigard® is pulled off after 1–3 days; it removes both wound exudate and necrotic tissue. In our patient, after 2 weeks of Epigard® application, the wound bed was ready for skin grafting. The ulcer was successfully grafted.

Management of non-healing ulcers varies depending on the type of ulcer (i.e., infected, ischemic or not, exudative or dry, necrotic or granulated).[8] In the current case, the ulcer was infected, necrotic and had moderate exudation. We started the treatment protocol with culture-driven antimicrobials, HBOT and daily wound care and combined Epigard® as soon as the infection subsided and the wound bed was free from necrotic tissue. Two weeks after the use of Epigard® the ulcer was ready for skin grafting. The ulcer healed without recurrence. There is not any particular therapy/product that will heal all type of wounds. We can achieve better results provided that wound care products and advanced treatments are used at the right time.

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