

A Favorable Response to Hyperbaric Oxygen Therapy and Bioactive Glass Fiber Matrix in Pyoderma Gangrenosum: A Case Report



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INTRODUCTION

Pyoderma gangrenosum (PG) is a rare, inflammatory neutrophilic dermatosis characterized by painful, rapidly progressive ulcerations with undermined, violaceous borders. PG remains a diagnosis of exclusion due to its nonspecific histopathology and clinical overlap with infectious, vascular, or neoplastic ulcers.

Standard treatment involves systemic corticosteroids and immunosuppressive therapy, which may be contraindicated in patients with comorbidities such as uncontrolled diabetes. Hyperbaric oxygen therapy (HBOT) and advanced wound matrices like borate-based bioactive glass (BBGFM) offer alternative strategies for promoting tissue regeneration and wound healing.

This case presents the first known use of HBOT in combination with BBGFM in a patient with recalcitrant PG and uncontrolled diabetes, resulting in complete wound resolution.

METHODS

A 56-year-old Hispanic male with type 2 diabetes (HbA1c >14.9%), hypertension, and dyslipidemia presented with a chronic, painful ulcer on the left lateral lower leg. Initial wound size was 4.2 x 3.5 x 0.1 cm, which progressed to 8.9 x 10 x 0.6 cm despite conservative care.

Imaging confirmed adequate perfusion, and biopsy revealed chronic inflammation with eosinophils and dermal fibrosis, consistent with PG.

Intervention included:

- Surgical debridement (12/16/23)
- 1 month of negative pressure wound therapy
- 40 sessions of HBOT (2.4 ATA, 90 min, 5x/week)
- Application of BBGFM beginning 6/5/24
- Continued HBOT post-BBGFM

RESULTS

The wound demonstrated progressive contraction, granulation, and epithelialization. Key wound size measurements:

02/14/24 – 8.9 x 10 x 0.6 cm (Debridement)
06/05/24 – 6 x 7 x 0.1 cm (1st BBGFM application)
06/19/24 – 5 x 5 x 0.1cm (2 weeks post-BBGFM)
09/11/24 – 3.7 x 5 x 0.2 cm (14 weeks post-BBGFM)
12/18/24 – 0.9 x 0.9 x 0.1 cm (32 weeks post-BBGFM)
03/15/25-- HEALED

Patient reported improved pain, mobility, and sleep. No complications or adverse effects were observed from HBOT or BBGFM.

DISCUSSION

This case highlights the effectiveness of combining hyperbaric oxygen therapy (HBOT) and BBGFM in treating refractory pyoderma gangrenosum (PG) in a patient with significant metabolic comorbidities. HBOT enhanced tissue oxygenation, reduced inflammation, and promoted angiogenesis, creating an optimal wound-healing environment. BBGFM provided a bioactive scaffold, supporting angiogenesis, granulation and re-epithelialization through controlled ionic release (boron, calcium, magnesium, phosphate). This dual-modality approach resulted in complete wound closure and high patient satisfaction, demonstrating its potential as a non-immunosuppressive strategy for managing complex PG in high-risk patients. Given the limited treatment options for PG, these findings suggest that HBOT combined with bioactive wound matrices may be a valuable alternative for patients with poorly controlled diabetes or contraindications to immunosuppressive therapy.

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Acknowledgements: "Mirragen Advanced Wound Marix, ETS Wound Care, LLC. This poster was prepared in collaboration with ETS Wound Care, LLC. All protocols and clinical assessments were conducted and reported independently by Endeavor Health without any financial compensation from the manufacturer. For application instructions and risks of this device, please refer to the Mirragen Instructions for Use.