



Dermatology Reports

<https://journals.pagepress.net/dr>

eISSN 2036-7406



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Società Italiana di Dermatologia
Chirurgica, Oncologica, Correttiva ed Estetica

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Please cite this article as:

Oley MH, Oley MC, Sukarno V, et al. Hyperbaric oxygen therapy in the reconstruction of giant rhinophyma: a case series. Dermatol Rep 2026 [Epub Ahead of Print] doi: 10.4081/dr.2026.10365

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Received: 28 March 2025; Accepted: 19 March 2026.

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Hyperbaric oxygen therapy in the reconstruction of giant rhinophyma: a case series

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Key words: rhinophyma; hyperbaric oxygen therapy; skin graft survival; wound healing; surgical excision.

Contributions: all the authors wrote, read, and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

Conflict of interest: the authors declare no conflict of interest.

Ethics approval and consent to participate: ethics approval was not required. All the procedures adopted in this study were in accordance with the ethical standards of the World Medical Association Declaration of Helsinki. All patients provided written informed consent to participate.

Informed consent: all patients have given written informed consent for the publication of this manuscript and any accompanying images.

Availability of data and materials: all data underlying the findings are fully available.

Abstract

Rhinophyma is a progressive, disfiguring form of rosacea that affects the nasal soft tissues and leads to functional and cosmetic challenges. Surgical excision is the primary treatment, but healing can be complicated by scarring, infection, and graft failure, especially in extensive lesions. Hyperbaric oxygen therapy (HBOT) has been suggested as an adjunctive treatment to enhance healing, reduce inflammation, and improve skin-graft survival. This case series presents three patients with giant rhinophyma who underwent surgical excision, with one requiring a split-thickness skin graft (STSG). Postoperatively, HBOT sessions (90 minutes at 2.4 atmospheres absolute [ATA]) were administered for 5-10 days, depending on the lesion severity. All patients demonstrated excellent healing with complete epithelialization and no evidence of hypertrophic scarring or short-term recurrence. HBOT contributed to faster recovery, improved skin-graft survival, and enhanced cosmetic outcomes. These findings suggest that HBOT is a promising adjunct in the surgical management of rhinophyma, although larger studies are required to validate its efficacy.

Introduction

Rhinophyma is a disfiguring dermatological condition characterized by progressive hypertrophy of the sebaceous glands of the nose, which leads to nasal enlargement, irregular contours, and nodular deformities.¹ It represents a severe manifestation of rosacea and primarily affects middle-aged to elderly men, with a male-to-female ratio ranging from 5:1 to 30:1.² The etiology is unclear but is thought to involve chronic inflammation, vascular abnormalities, and sebaceous gland hyperplasia. Risk factors include sun exposure, alcohol consumption, smoking, and occupational exposure to dust.³

Clinically, rhinophyma presents with overgrowth of nasal soft tissues, redness, telangiectasias, and a bulbous nasal appearance. In severe cases, it may lead to nasal obstruction.^{3,4} The disease predominantly affects the lower two-thirds of the nose, sparing the nasal sidewalls. Histopathological examination can reveal hyperplasia of the sebaceous glands, fibrosis, and chronic inflammation.⁴

Various surgical approaches are available, including cold-blade excision, electrosurgery, laser ablation, cryosurgery, and dermabrasion.⁵ Recently, hyperbaric oxygen therapy (HBOT) has been explored for its role in complex wound healing and compromised skin-graft survival.⁶ Reports of its specific application in the postoperative management of rhinophyma are scarce in the literature. HBOT enhances oxygen delivery to ischemic tissues, promotes angiogenesis, and modulates inflammation. This case series, therefore, aims to contribute to the limited evidence by examining the role of HBOT in achieving optimal outcomes in advanced rhinophyma.

Case Reports

Case 1

A 51-year-old man presented with a 10-month history of nasal swelling. He reported pulsating pain (visual analog scale [VAS] 3/10) but denied having any ulceration or bleeding. Occupational exposure included dust but minimal sunlight. He had no smoking or alcohol history. Examination revealed a 3×5 cm², firm, irregular swelling on the nasal dorsum and apex, causing a large, bulbous distortion of the normal nasal architecture (Figure 1A).

Laboratory findings were unremarkable except for a slightly elevated creatinine level (1.15 mg/dL). Histopathology confirmed sebaceous hyperplasia and chronic inflammation.

Under general anesthesia, the lesion was excised layer by layer using bipolar electrocautery while preserving the dermis and nasal cartilage. The wound was dressed with moist paraffin gauze. HBOT was initiated postoperatively (90 minutes at 2.4 atmospheres absolute [ATA] for 5 days) (Figure 1B). By 1 month, complete epithelialization was achieved with well-maintained nasal contours (Figure 1C), no hypertrophic scarring, and no recurrence at the 12-month follow-up.

Case 2

A 64-year-old carpenter presented with progressive nasal swelling over 5 years. He had significant occupational dust exposure, chronic alcohol use, and a 20-year smoking history. Examination revealed a 4×6 cm², firm, irregular swelling involving the dorsum, resulting in a pendulous, pear-shaped deformity (Figure 2A), ala, and apex, as well as enlarged pores and erythema. Laboratory tests showed elevated alanine aminotransferase (ALT; 95 U/L), aspartate aminotransferase (AST; 56 U/L), random blood glucose (269 mg/dL), and glycated hemoglobin (HbA1c; 7%), suggesting fatty liver and uncontrolled diabetes.⁷ Histopathology confirmed that there was proliferation and inflammation of the sebaceous glands.

Excision was performed under general anesthesia using bipolar electrocautery. A 6×5 cm² split-thickness skin graft (STSG) from the periumbilical region was applied. Postoperatively, an extended course of HBOT (90 minutes at 2.4 ATA) was administered for 10 days to support the integration and vascularization of the STSG.

At 2 weeks, the graft showed good vascularization (Figure 2B), and by 1 month, it had fully integrated (Figure 2C). The patient reported satisfaction with the cosmetic and functional results, as well as no recurrence, graft contracture, or pigmentary issues at the 8-month follow-up.

Case 3

A 60-year-old farmer presented with a 1-year history of nasal swelling and mild pulsating pain. His occupational exposure included significant sun and dust exposure. Examination revealed a 7×5.5 cm² nasal mass involving the dorsum, ala, and apex, resulting in a pendulous, pear-shaped deformity (Figure 3A). The surface was noted to be bumpy, with prominent pores and erythema. The laboratory findings were normal. Histopathology showed polymorphonuclear leukocytes and lymphocytes, which confirmed that the lesion was benign with suppurative inflammation.

Excision was performed under general anesthesia using bipolar electrocautery. Postoperatively, HBOT (90 minutes at 2.4 ATA) was applied for 5 consecutive days. At 1 month, complete epithelialization was noted, with minor scabs that were expected to resolve naturally (Figure 3B). The patient expressed high satisfaction with the cosmetic and functional outcomes and had no recurrence or hypertrophic scarring at the 6-month follow-up.

As summarized in Table 1, all three male patients underwent surgical excision *via* bipolar electrocautery followed by adjunctive HBOT. The treatment protocol was adapted to wound complexity; an extended 10-session course was utilized for Patient 2 to support the survival of a STSG, while the other patients received a standard 5-session course. Despite these variations, all three patients achieved excellent healing by 1 month, with either complete epithelialization or full graft integration, and no significant complications were noted during their follow-up.

Discussion

This case series contributes to the limited literature on adjunctive therapies for giant rhinophyma. To our knowledge, it is among the few reports describing the use of postoperative HBOT for this condition. In this series of three patients with giant rhinophyma, surgical excision using bipolar electrocautery combined with postoperative adjunctive HBOT resulted in excellent functional and cosmetic outcomes. We observed rapid and complete epithelialization, successful integration of a STSG in one case, and no instances of hypertrophic scarring or short-term recurrence. These findings suggest that HBOT may be a valuable adjunct in the complex reconstruction required for this debilitating condition.

Surgical excision remains the primary treatment for rhinophyma, with techniques ranging from cold-blade excision and dermabrasion to CO₂ laser ablation and various forms of electrosurgery.⁴ While effective, each method carries risks, including scarring, pigmentary changes, and thermal injury, particularly in severe cases requiring extensive tissue removal. In our series, bipolar electrocautery was used to achieve precise excision and hemostasis. For the extensive defect in one patient, an STSG was necessary, a scenario where graft survival is paramount.

CO₂ laser treatment is widely used, particularly for moderate to severe rhinophyma. Fractional CO₂ lasers reduce healing time and complication rates, and they are preferable for darker skin types. However, fully ablative CO₂ lasers have higher risk of scarring, and recurrence is possible without adjunctive treatments like isotretinoin.^{8,9} Electrosurgery, particularly monopolar diathermy knife surgery, is effective for severe cases due to precise tissue excision and hemostasis. However, it poses risks of hypertrophic scarring, hypopigmentation, prolonged erythema, and nasal ala notching.⁴ Radiofrequency electrosurgery offers precision, minimal bleeding, and reduced thermal damage. Chen *et al.* found it to be cost-effective compared to lasers, with shorter recovery times.¹⁰ However, its long-term efficacy requires further study as thermal injury remains a concern. The five-blade scratcher technique under tumescent anesthesia has shown favorable cosmetic results, with 90% of patients rating its outcomes as very good or good, and the recurrence rate is low.⁷ However, it is less effective for advanced rhinophyma. Secondary intention closure with recombinant human basic fibroblast growth factor facilitates natural tissue regeneration and reduces the need for grafting. It minimizes scarring but requires frequent dressing changes, which increases the risk of infection.¹¹ The successful integration of the STSG in Patient 2, with visible vascularization by 2 weeks, aligns with the known mechanisms of HBOT, which include the promotion of angiogenesis and stimulation of endothelial progenitor cells.¹²⁻¹⁴ Similarly, the rapid epithelialization observed in all patients is consistent with HBOT's role in enhancing oxygen delivery to healing tissues and modulating local inflammatory responses. By increasing tissue oxygen tension, HBOT may also enhance immune responses and inhibit the growth of anaerobic bacteria,¹⁵ creating a more favorable environment for uncomplicated wound healing.¹⁶

While the broader efficacy of HBOT for all acute surgical wounds remains a subject of debate, as highlighted by systematic reviews from Dauwe *et al.*¹⁷ and Eskes *et al.*¹⁸, our findings suggest a potential niche application. The specific context of extensive nasal reconstruction following rhinophyma excision characterized by significant tissue trauma and potentially compromised vascular beds may represent a scenario where the benefits of hyperoxygenation are particularly pronounced. Our results contribute preliminary evidence to this ongoing discussion.

This study has several limitations. The small sample size and case series design limit generalizability and preclude statistical analysis. The absence of a control group makes it difficult to attribute the outcomes solely to adjunctive HBOT, as surgical technique and standard care may also have contributed. In addition, the short follow-up period restricts assessment of recurrence and long-term complications. These preliminary findings therefore require confirmation in larger, prospective controlled studies.

Conclusions

Adjunctive HBOT, when combined with meticulous surgical excision, appears to be a safe and effective strategy in the management of giant rhinophyma. Our observations of enhanced wound healing and successful graft integration are promising. While these results must be interpreted with caution due to the study's design, they provide a strong rationale for future prospective studies to establish optimal protocols and definitively validate the role of HBOT in this challenging patient population.

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Figure 1. Clinical course of Patient 1. **A)** Preoperative presentation of a 51-year-old male with giant rhinophyma; **B)** postoperative day 7, following surgical excision and 5 sessions of adjunctive HBOT; **C)** 1-month follow-up demonstrating complete healing and restoration of nasal contour.

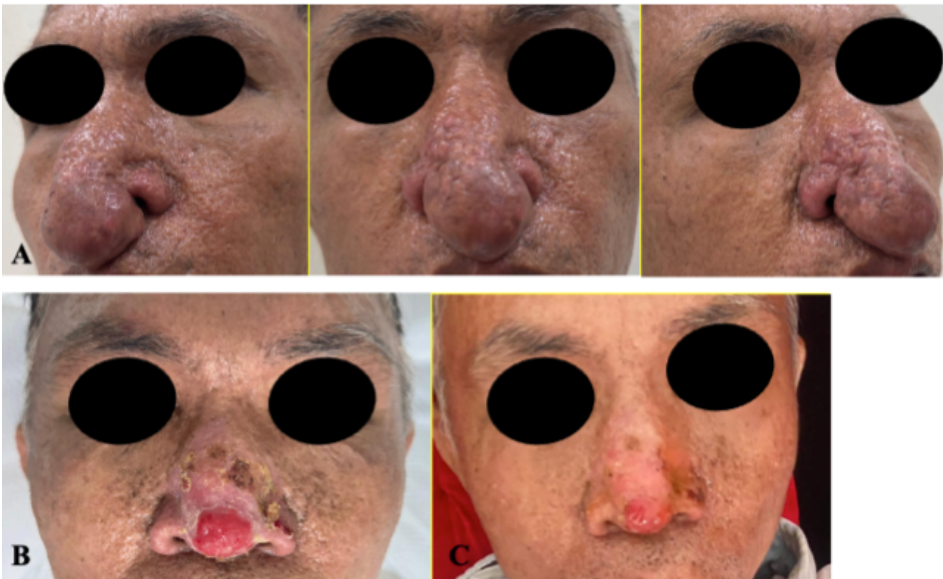


Figure 2. Clinical course of Patient 2. **A)** Preoperative presentation of a 64-year-old male with extensive rhinophyma; **B)** 2 weeks post-excision with STSG and 10 sessions of HBOT, showing excellent graft vascularization; **C)** 1-month follow-up with complete graft integration.

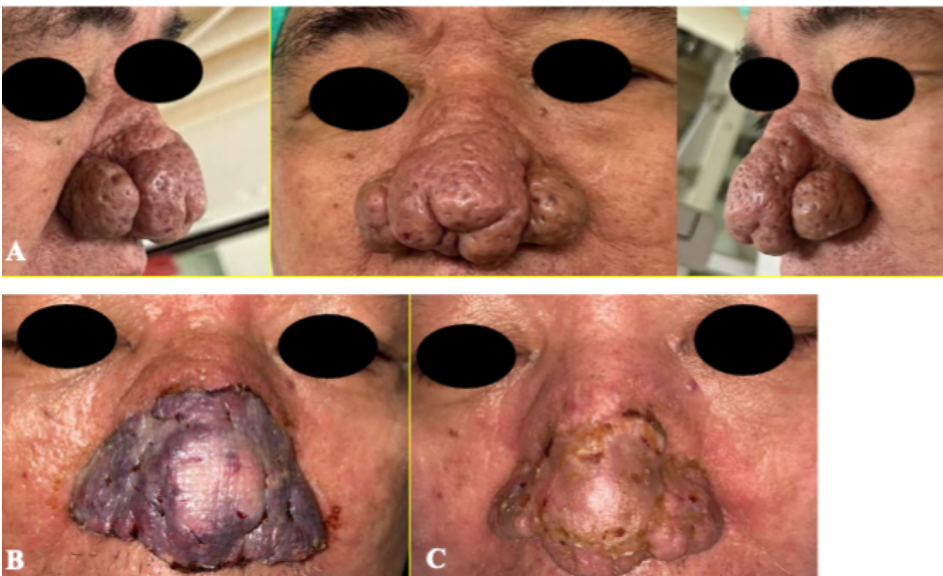


Figure 3. Clinical course of Patient 3. **A)** Preoperative presentation of a 60-year-old male with giant rhinophyma, demonstrating an extensive, lobulated mass distorting the nasal ala and apex; **B)** 1-month follow-up after surgical excision and 5 sessions of adjunctive HBOT, showing complete epithelialization and favorable restoration of the nasal contour.



Table 1. Summary of clinical data for patients with giant rhinophyma treated with surgical excision and adjunctive HBOT.

| Characteristic | Case 1 | Case 2 | Case 3 |
|--------------------------------|---|--|---|
| Age (years)/sex | 51/male | 64/male | 60/male |
| Lesion size (cm ²) | 3×5 | 4×6 | 7×5.5 |
| Key comorbidities | Mildly elevated creatinine (1.15 mg/dL) | Uncontrolled diabetes (HbA1c 7%), fatty liver (elevated ALT/AST), chronic alcohol use, smoking history | None reported; normal laboratory findings |
| Surgical technique | Bipolar electrocautery excision | Bipolar electrocautery excision | Bipolar electrocautery excision |
| Graft use | No | Yes, 6×5 cm ² STSG | No |
| HBOT protocol | 5 daily sessions | 10 daily sessions | 5 daily sessions |
| Healing outcome | Complete epithelialization at 1 month | Full graft integration at 1 month | Complete epithelialization at 1 month |
| Follow-up duration | 12 months | 8 months | 6 months |

HbA1c, glycated hemoglobin; ALT, alanine aminotransferase; AST, aspartate aminotransferase; HBOT, hyperbaric oxygen therapy; STSG, split-thickness skin graft.