Laser Vaporization: A Novel Treatment of Botryomycosis

DAVID J. LEFFELL, M.D.
MARC D. BROWN, M.D.
NEIL A. SWANSON, M.D.

LASERS

Abstract. Botryomycosis is an uncommon, chronic infection of the skin most often caused by *Staphylococcus aureus*. It has been successfully treated using carbon dioxide laser vaporization in a case in which antibiotic therapy failed, and surgical excision was not feasible. J Dermatol Surg Oncol 1989; 15:703–705.

INTRODUCTION

Botryomycosis (also known as actinophytosis) is an uncommon, chronic infection of the skin and viscera caused most often by *Staphylococcus aureus*. It appears as a suppurative, often granulomatous lesion, which can mimic a deep fungal infection clinically and histologically. The disease responds variably to antibiotic therapy, and surgery may be curative in isolated lesions. We present a case of botryomycosis in which antibiotic therapy failed and surgical excision was not feasible. We ablated the plaque of botryomycosis successfully with carbon dioxide (CO_2) laser vaporization in a novel approach to the treatment of this chronic infectious disease.

David J. Leffell, M.D., is Assistant Professor and Chief of Mohs Surgery, Yale University, New Haven, Connecticut.

Marc D. Brown, M.D., Lecturer, and Neil A. Swanson, M.D., Associate Professor of Dermatology, are from the University of Michigan, Ann Arbor, Michigan.

Address reprint requests to David J. Leffell, M.D., Yale University School of Medicine, Department of Dermatology, 333 Cedar Street, New Haven, CT 06510.

CASE REPORT

A 47-year-old man presented to the outpatient dermatology clinic at the University of Michigan Medical Center with a 2-year history of a slowly enlarging lesion on the dorsum of the right foot. The patient stated that the plaque lesion occasionally drained small amounts of pustular material. Although the lesion was not always tender, pain with drainage occasionally interfered with his occupation as a factory worker. There was no specific antecedent trauma to the foot, or introduction of a foreign body. The patient was otherwise in excellent health and was not taking any medication.

An initial biopsy, done several months prior to presentation, demonstrated only acute and chronic inflammation with some vascular proliferation. Initially, the differential diagnosis of this cutaneous lesion included a fungal infection and therapeutic trials of ketoconazole and supersaturated potassium iodide were tried unsuccessfully.

At the time of our initial examination, the patient had a 3.5 × 2.5-cm indurated, violaceous plaque on the right dorsal foot (Fig. 1). No ulceration or pustular drainage was noted. The remainder of the cutaneous examination was negative and there was no palpable adenopathy. An x-ray of the foot revealed no osseous disease. An incisional biopsy was performed and was sent for routine histologic examination, as well as complete bacterial, fungal, and mycobacterial cultures. The potassium hydroxide (fungal) examination and AFB stains were negative. All subsequent fungal and mycobacterial cultures were negative. Bacterial cultures isolated two strains of staphylococci. On biopsy, pathognomonic grape-like basophilic granules were noted. A

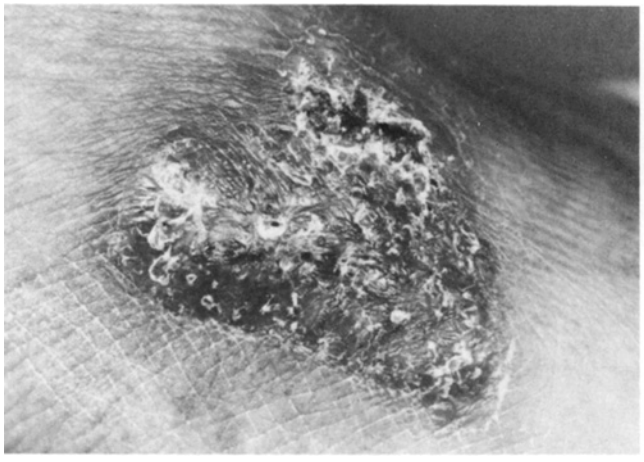

FIGURE 1. Cutaneous botryomycosis. Verrucous and violaceous plaque on the dorsum of the right foot. The lesion occasionally suppurated.

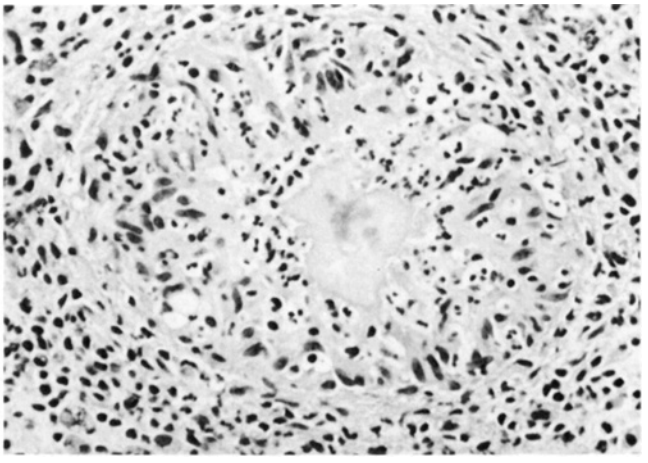

FIGURE 2. Biopsy specimen of botryomycosis reveals basophilic granules within a suppurative focus that contains the causative organism.

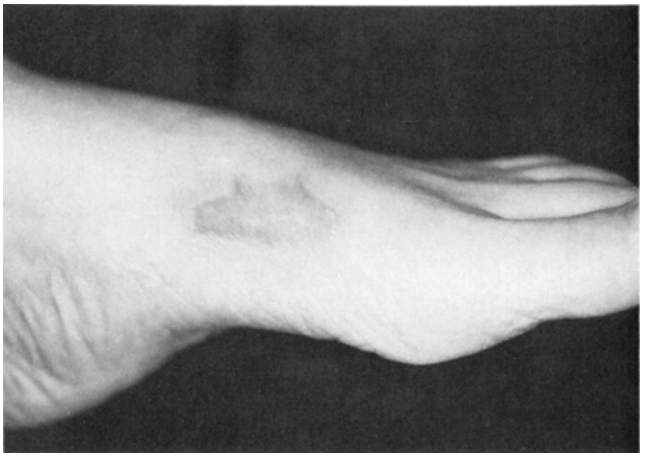

FIGURE 3. Right foot: Six months following laser vaporization of the right foot lesion demonstrating soft, shiny scar with resolution of the disease process off antibiotics.

diagnosis of botryomycosis was made on the basis of histologic, bacterial, and clinical findings.

Our patient responded poorly to lengthy courses of multiple antibiotics including tetracycline, erythromycin, cephalosporins, penicillin, dicloxacillin, and rifampin. Because of the technical difficulty in excising this large lesion over the dorsum of the foot, CO_2 laser vaporization was performed. Informed consent was obtained and local anesthesia was achieved with lidocaine and epinephrine. With the CO_2 laser (Xanar Corporation, San Juan Capistrano, CA), set at 7 W in the continuous wave mode (2-mm spot size, irradiance 223 W/cm^2), eight passes were made over the lesion. The char was removed with vigorous application of hydrogen peroxide following each pass. After the diseased tissue was vaporized, a bed of normal-appearing dermis was visualized and the therapeutic session was therefore considered complete. The area was cleansed with hydrogen peroxide and dressed with bacitracin and a gauze dressing. Dicloxacillin (500 mg 4 times a day) and rifampin (600 mg each day) were continued for 1 month.

Reepithelialization occurred in association with wound contraction. There was minimal inflammation at the edges. Four weeks following therapy, epithelialization of the wound was complete, although minimal erythema was present around the wound edges. There was no evidence of recurrence, the patient was very pleased with the result, and antibiotics were stopped at this time.

Five months following therapy the patient was evaluated. At this time he was noted to have an epithelialized scar over the dorsum of the foot with no evidence of recurrence. The scar was soft, pliable, and flat, but slightly erythematous. At the anterior edge of the lesion two milia were noted (Fig. 3). Antibiotics were not resumed and it was determined that laser vaporization resulted in a cure of the botryomycosis.

DISCUSSION

Botryomycosis was first described in animals by Bollinger in 1870, at which time he identified the characteristic fungus-like granules and nodules occurring in the lungs of a horse.[1] The term botryomycosis was later coined, which derives from the Greek word "botrys" meaning "bunch of grapes" and "mycosis" indicating a fungal cause.[2] However, a fungus has never been isolated in the disease. It was not until 1919 that Magron firmly established the bacterial origin of the disease.[3] Since

the original description, there have been over 70 reported cases in the literature. The most extensive review (48 cases) was by Winslow in 1959.[4] *Staphylococcus aureus* is the most frequent causative microorganism,[4] but other reported bacterial agents are often cultured in conjunction with it. These include *Pseudomonas, Escherichia coli, Proteus vulgaris, Streptococcus,* gram-negative coccobacillus, and *Proprionibacterium acnes.* Fungal and mycobacterial cultures are consistently negative.

The two clinical presentations of botryomycosis are visceral and cutaneous. Cutaneous disease, which is probably the most frequent manifestation, may extend into the underlying muscle and bone.[5,6] The most frequently affected areas are exposed surfaces, such as the hands, feet, and head.[6] Intertriginous and gluteal areas are also involved.[7] In certain cases the infection may follow a traumatic event or be associated with a foreign body.[6] It is most commonly a solitary lesion but can be multiple and disseminated.

Visceral involvement occurs in the chronically ill or debilitated patient.[5] The lungs are the most frequently involved organ, but liver, kidney, brain, bowel, and prostate have been reported sites of infection.[6] Prognosis with visceral involvement is poor, with a mortality approaching 50%.[7] In contrast, the prognosis with cutaneous involvement alone is quite good. Although the cutaneous infection can be chronic, the associated morbidity is negligible, unless there is associated muscle or bone involvement.

The histologic hallmark of botryomycosis is a central area of suppuration in the dermis within which granules are observed.[4] These granules range from a few microns to 2 mm in diameter. The granules are basophilic, may have a grape-like appearance, and can be embedded in a hyaline matrix. The granules are brightly PAS (Periodic acid Schiff) positive, suggesting the presence of polysaccharide. The periphery of the granule has an amorphous eosinophilic coating referred to as the Splendore-Hoeppli phenomenon. Bacteria are found in the center of the grains, and there is a nonspecific chronic inflammatory reaction around the area of central suppuration.

The pathogenesis of the disease is unknown. It is unclear why cutaneous infections with these bacterial pathogens result in a fungus-like granule. It has been proposed that the strains of the bacteria involved may be less virulent than normal strains.[8] The possibility has also been raised that a defect in the host defense could account for an initial infection with a less virulent pathogen.[7] Winslow and Steen speculated on a possible hypersensitivity reaction to an antigen-antibody complex.[9] The prevailing belief is that this unusual cutaneous infection results in some way from a symbiotic balance between the virulence of the infectious agent and the tissue resistance of the host.

Perhaps because of underlying immunologic abnormalities, treatment often fails. The patient reported here did not respond to antibiotic therapy and the location of the lesion made excision difficult. The use of CO_2 laser ablation offered the opportunity to treat the lesion itself with appropriate margins without the risk of impinging on important orthopedic structures on the dorsum of the foot. The uncomplicated and rapid healing course, associated with minimal patient morbidity and disability, suggests that laser therapy was of benefit. Other chronic suppurative cutaneous infections may also respond to a combination of initial antibiotic therapy and laser surgery.[10] Although we do not recommend laser therapy as a primary mode of therapy, when antibiotic therapy fails in botryomycosis or similar conditions, laser vaporization may offer a chance for cure in the symptomatic or immune-compromised patient.

Acknowledgments. We wish to thank J.T. Headington, M.D., for his help in evaluating the histopathology, and Gwendolyn Day for her assistance in preparation of this manuscript.

REFERENCES

1. Bollinger O. Mycosis der Lunge beim ferde. Arch Pathol Anat 49:583–586, 1870.
2. Rivolta S. Del micelio e delle varieta e specie di discromiceti pathogenic. Giorn Anat Fisiol Patol Animali 16:181, 1984.
3. Magron J. Les formes actinomycotiques du staphylocoque. Ann Inst Pasteur 35:344–374, 1919.
4. Winslow DJ. Botryomycosis. Am J Pathol 35:153–167, 1959.
5. Picou K, Batres E, Jarratt M. Botryomycosis: A bacterial cause of mycetoma. Arch Dermatol 115:609–610, 1979.
6. Hacker P. Botryomycosis. Int J Dermatol 22:455–458, 1983.
7. Brunken RC, Lichon-Chao N, Van den Broek H. Immunologic abnormalities in botryomycosis. J Am Acad Dermatol 9:428–434, 1983.
8. Drake CH, Sucler MT, Canuteson RI. A case of staphylococci actinophytosis (botryomycosis) in man: The tenth reported human case. JAMA 123:339–341, 1943.
9. Winslow DJ, Steen FG. Considerations in the histologic diagnosis of mycetoma. Am J Clin Pathol 42:164–169, 1964.
10. Kantor GR, et al. Cutaneous blastomycosis: Report of a case presumably acquired by direct innoculation, treated by carbon dioxide laser vaporization. Cleve Clin J Med 54:121–124, 1987.