

MYCETOMA

James H. Morgan, Jr., D.P.M.

Mycetoma (Madura Foot) is a rare, localized, destructive infection of the skin and subcutaneous tissues. Fascia, muscle and bone may be involved. The result can be a severely disfiguring mass on the sole of the foot making it extremely difficult to walk or wear shoes comfortably. The condition is rarely characterized by severe pain. Two cases of mycetoma are presented demonstrating the importance of early recognition of this condition to avoid the chronic result of the disease.

EPIDEMIOLOGY AND PATHOGENESIS

The first case of this disease was reported by Gill¹ in the Madura district of India in 1842, hence the name "Madura foot." Since then, cases have been reported across the world, primarily in rural areas. Two types of mycetoma have been identified - eumycetoma and actinomycetoma. Those caused by true fungi are termed eumycetoma. *Pseudallescheria*, *Madurella*, *Phialophora*, *Pyrenochaeta*, *Aspergillus*, *Fusarium*, and *Acremonium* species have been isolated in these infections.² Actinomycetoma is caused by a group of aerobic actinomycetes, including species of *Actinomyces*, *Streptomyces*, and *Nocardia*.² The most common causative organisms in the Western Hemisphere are *Pseudallescheria boydii*, *Nocardia brasiliensis*, and *Actinomyces madurae*.^{3,4} These organisms exist in the soil as saprophytes and are traumatically introduced into the tissues of the foot via a splinter, glass, thorn prick, or cut. Males are infected five times more than females. The age range of those infected is from 20 to 50 years of age. Farmers in rural areas are the most common victims of this infection.

CLINICAL PRESENTATION

The first clinical manifestation of mycetoma is the presence of a small papular or nodular subcutaneous mass on the dorsal or plantar aspect of the foot that grows progressively larger. The actinomycetoma develop at a more rapid rate than the eumycetoma. The lesions grow larger and eventually rupture or ulcerate forming sinus tracts. Grains of

the infecting organism and surrounding neutrophils exude from the sinuses. As new adjacent lesions form, the older, ruptured lesions scar eventually resulting in a chronic, swollen, deformed mass of scar tissue. The infection can spread along fascial planes and eventually invade muscle, vessels, nerve, and bone. Regional lymphadenopathy can occur; however, hematogenous spread has not been reported.⁵ The chronic form of mycetoma is seldom painful, however the edematous deformed foot can make it difficult to wear shoe gear.

DIAGNOSIS

Initial diagnosis is usually made from the clinical appearance. The triad of indurated edema, multiple draining sinuses with grain-filled purulence and location on the foot make for a rather easy diagnosis.⁶ However, in the early stages of development, these lesions may be difficult to differentiate from any other subcutaneous nodular mass. Aspiration for culture and sensitivity of the grains including bacterial (aerobic and anaerobic), fungal, and acid fast stains are helpful indicators. Histologic examination of the grains may aid in identifying the organism based on the color, size, and staining characteristics of the grains.⁷ Magnetic resonance imaging (MRI) will often show a multi-chambered mass. Plain radiographs will only show osseous involvement. They should be used to rule out the presence of a foreign body or osteomyelitis in extensive chronic cases. Surgical biopsy can also be excellent diagnostic tool.

Differential Diagnosis

The differential diagnosis for mycetoma is extensive. Early lesions can be easily confused with foreign body inclusion cysts, ganglion cysts, fibromas, cold abscess, thorn granuloma, or any of a number of benign or malignant tumors. The chronic form can be confused with another infection resulting in multiple draining sinuses caused by gram-positive and gram-negative organisms referred to as botryomycosis.^{2,8} Chronic osteomyelitis should also be considered.

TREATMENT

The combined medical and surgical approach has been the mainstay of treatment for mycetoma.^{8,9} Surgical excision of the lesions followed by appropriate antibiotics has consistently produced the lowest recurrence rates. Antibiotic therapy is of extreme importance in chronic cases as surgical excision alone has the highest recurrence rates. For treatment of the eumycetoma, ketoconazole and itraconazole are used most often. Penicillin, trimethoprim-sulfamethoxazole, dapsone, amikacin, and streptomycin sulfate have been used for treating the actinomycetoma.^{2,8} If recognized early and a clean resection is achieved, then three months of antifungal or six weeks of antibiotics (depending on the causative organism) is usually adequate.

CASE PRESENTATIONS

Case One

A 51-year-old man presented with a three-day history of a "sore knot" on the plantar aspect of the left foot. He denied any history of trauma or puncture wound. The knot was getting warm, red, and extremely tender. Review of the medical history was significant for cluster headaches and a history of a draining wound on his right leg that was diagnosed as a brown recluse spider bite. The bite healed with local wound care and antibiotics. He denied taking any medications and had no allergies. He smoked one pack of cigarettes per day and drank one to two beers per week. He worked as a salesman at a local interior design business and had no history of foreign travel.

Examination revealed a thin, but otherwise healthy man in no acute distress. He was afebrile and had stable vital signs. Neurovascular status was within normal limits. A firm, mobile, nodular subcutaneous mass measuring 4 centimeters by 2 centimeters was located proximal to the second, third, and fourth metatarsal heads on the plantar aspect of the left foot. Minimal localized edema, erythema, and increased temperature were noted. Plain film radiographs showed no signs of foreign body or osseous involvement. (Fig. 1) Following a tibial nerve block of the left foot, the mass was aspirated under sterile technique. No aspirate was obtained. Dexamethasone sodium phosphate (1/2 cc) was injected locally. The patient was placed on cephalexin 500 mg every six hours and hydrocodone as needed for pain.



Figure 1. Initial plain film radiographs show no evidence of foreign body or bony involvement.

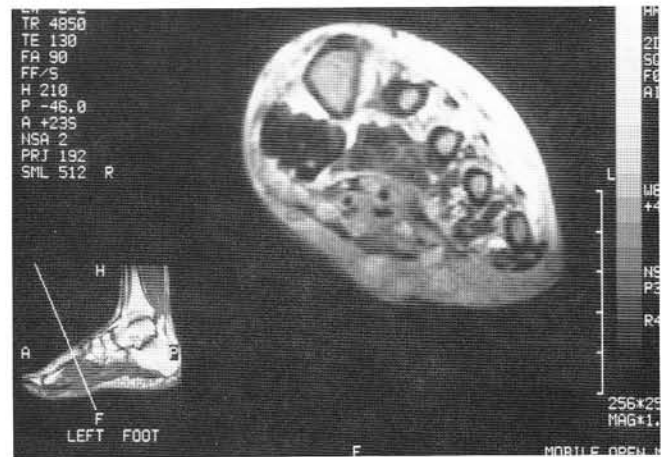


Figure 2. Frontal plane MRI scan demonstrates a multi-chambered cluster of increased soft tissue edema without a well-defined abscess.



Figure 3. Sagittal plane MRI scan



Figure 4. Postoperative clinical photo taken the day after surgery. Note the extensive involvement of the plantar tissues.

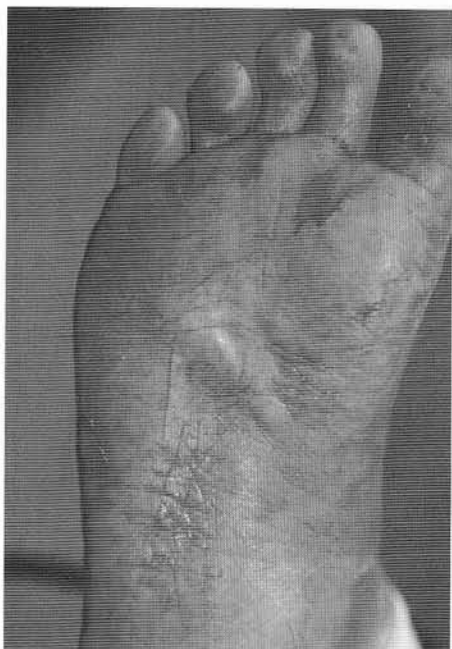


Figure 5. Clinical photo taken of the mass before surgery.

The patient returned three days later with a two-day history of increased pain and swelling. He was afebrile. The entire foot was edematous, and erythema and ecchymosis were noted along the plantar aspect of the arch. No drainage was noted, and there was no sign of ascending cellulitis. The lesion had doubled in size. Cefazolin 2 mg was given intramuscularly, and the patient was sent for a MRI. The study showed increased soft tissue edema without evidence of abscess. (Figs. 2, 3) The next day the patient had no improvement and was now experiencing fever and chills. His temperature was 100.3°F. The patient was admitted to the local hospital and an infectious disease consult was

obtained. He was placed on ticarcillin-clavulanic acid 3.1 mg intravenously every six hours. His white cell count on admission was 12,800. The next day his systemic symptoms had resolved. He was afebrile, and his white cell count was 11,200. His foot now had a localized greenish abscess beneath the epidermis. There was still no drainage.

An incision and drainage was performed the following day. Brownish yellow purulence was noted to extend deep to the plantar fascia into the plantar musculature. No tendon sheath involvement was noted. The epidermis was separated from the dermis around the periphery of the abscess. There was no malodor. The wound was irrigated and packed open. A stat gram stain showed Actinomycetales. Antibiotics were changed to ampicillin 500 mg intravenously every six hours. Irrigation and packing of the wound was performed daily. The wound was healthy and clean the day following surgery. (Fig. 4). The final culture and sensitivity isolated *Nocardia brasiliensis*. The patient was discharged from the hospital three days after surgery on trimethoprim-sulfamethoxazole DS twice daily by mouth and ceftriaxone 2 mg intravenously every day. Home health performed local wound care for three weeks, until the wound was superficial. The patient was kept non-weight bearing with crutches for three weeks. The intravenous antibiotics were discontinued after five weeks, and the oral antibiotics after six weeks. The wound was completely healed by secondary intention after six weeks without recurrence of infection. He had no limitation of function and limited scarring.

Case Two

A 45-year-old man presented with a seven month history of a mildly tender mass on the plantar aspect of the right foot. He recalled stepping on a piece of glass in his house nine months ago. The puncture wound healed uneventfully. The mass was noticed two months later. It was progressively growing larger and more tender. The patient was unable to run because of the discomfort. Review of medical history was unremarkable except as noted above. He worked as a school principal.

Physical examination showed an apparently healthy man in no acute distress. He was afebrile, and all vital signs were stable. His neurovascular status was intact. A firm, nodular subcutaneous mass measuring 2½ centimeters by 1 centimeter was located on the plantar aspect of the right foot just proximal to the third and fourth metatarsal heads (Fig. 5). There were no signs of infection and

no evidence of the previous puncture wound. Minimal tenderness was produced with palpation of the mass. Plain film radiographs showed no signs of foreign body or osseous involvement. The patient was placed in a soft accommodative insole and prescribed cephalexin 500 mg every six hours for one week. He was also instructed to apply warm saline compresses twice daily.

He returned a week later with no improvement. Following administration of a tibial nerve block to the right foot, the mass was aspirated under sterile technique. Yellowish, thick fluid was obtained and sent to a local lab for aerobic, anaerobic, and fungal culture and sensitivity. The patient was prescribed naproxen 500 mg twice daily. After one week, the culture was showing growth of a mold. The patient reported a reduction in pain, however he wanted to have the mass removed in six months, between school years. Two weeks after aspiration, the culture and sensitivity was positive for *Pseudallescheria boydii*. An infectious disease consult was obtained and the patient was placed on itraconazole 200 mg oral suspension twice daily. Five days later the mass was removed under local anesthesia. A transverse incision was used to excise the mass. The mass was well encapsulated and extended into the plantar musculature. The mass was excised in toto. (Fig. 6) The incision was closed and dressed. The mass was incised on the back table, and yellowish thick fluid with granules was noted. (Fig. 7)

The patient was kept non-weight bearing for one week with crutches and then allowed weight bearing on the heel for two weeks. Sutures were removed after three weeks, and there was no scarring noted. The itraconazole was continued for 12 weeks. The patient had no recurrence of the lesion and no hypertrophic scarring. He is now running without pain.

CONCLUSION

Mycetoma is a rare infection of the foot caused by fungal or bacterial organisms. Diagnosis can be difficult in the early stages of the disease prior to ulceration and sinus tract formation. Successful aspiration can be a useful tool to aid with the diagnosis in these early stages. Once a diagnosis of mycetoma has been made, excision of the lesion or incision and drainage followed by appropriate antibiotics can result in a complete cure without recurrence.

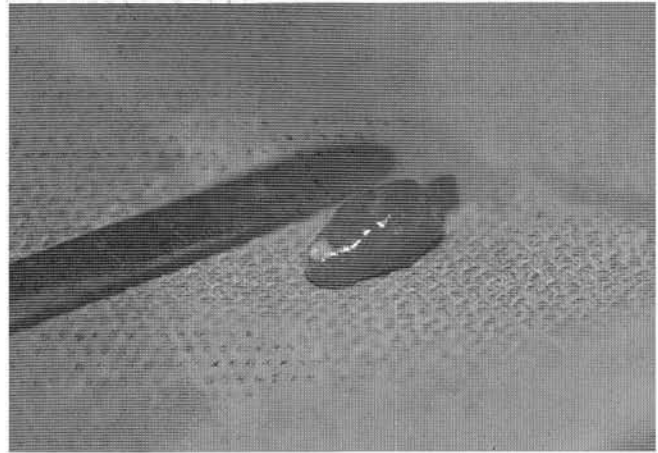


Figure 6. Intra-operative photo of the excised mass.

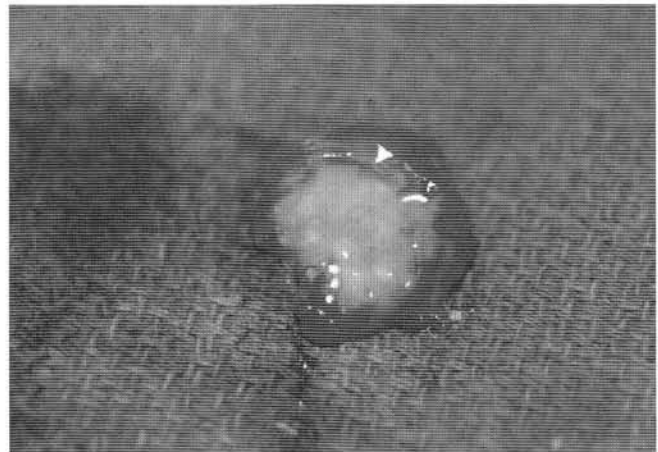


Figure 7. Incised mass containing suppurative granules. Note the thickness of the capsule of the mass.

REFERENCES

1. Gill: India Army Medical Reports. Churchill, London, 1874.
2. Mahgoub ES: "Agents of Mycetoma," in Mandel GL, Bennett JE, Dolin R (eds) *Principles and Practice of Infectious Disease*, Vol. 2, Churchill Livingstone, New York, 1995.
3. Green WO, Adams TE: Mycetoma in the United States, *Am J Clin Pathol* 42:75-91, 1964.
4. Lavalle P: "Micotomas: La Experiencia Mexicana. Problemas Actuales," in *Libro de Resumens II Simposio Internacional de Micetomas*, Taxco, Mexico, 1987.
5. El Hassan AM, Mahgoub ES: Lymph node involvement in Mycetoma, *Trans R Soc Trop Med Hyg* 66:165, 1972.
6. Vanbreuseghem R: The early diagnosis of Mycetoma, *Dermatol Int* 6:123-140, 1967.
7. Mahgoub ES: Mycetoma in Mahgoub ES (ed) *Tropical Mycoses* Beersse, Belgium, 1989.
8. Morris MI, Gurevitch A, Edwards JE: "Dematiaceae and Agents of Superficial Mycoses," in Gorbach SL, Bartlett JG, Blacklow NR (eds) *Infectious Diseases* WB Saunders, Philadelphia, 1992.
9. Young BA, Fee MJ, Giacopelli JA, Granoff DP, Kobayashi W: Mycetoma, *J Am Podiatr Med Assoc* 90:81-84, 2000.