Fungal Foes: Presentations of Chromoblastomycosis Post–Hurricane Ike

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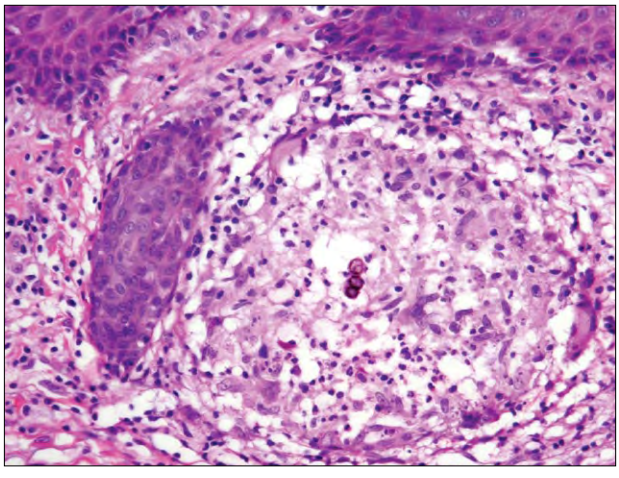
Chromoblastomycosis, also known as chromomycosis, is a chronic cutaneous and subcutaneous mycotic infection caused by a family of dematiaceous fungi. These species are found in the soil and on a variety of plants, flowers, and wood, primarily in tropical and subtropical regions. Infection typically results from implantation of spores into the subcutaneous tissue following trauma from plants, thorns, or wood splinters. We describe 3 patients with chromoblastomycosis who presented to the dermatology department at The University of Texas MD Anderson Cancer Center in Houston in the months following Hurricane Ike, which occurred in September 2008.

Case Reports

Patient 1—A 60-year-old white man developed a 1.2-cm red plaque on the left forearm concerning for basal cell carcinoma. He had a history of renal cell carcinoma with right partial nephrectomy in 2002 and squamous cell carcinoma of the scalp treated with surgery and radiation therapy in 2005 with no recurrence of either malignancy. He presented in November 2008, 2 months after Hurricane Ike. A shave biopsy was performed and pathology revealed epidermal hyperplasia, a dermal granulomatous reaction, and pigmented fungal organisms morphologically consistent with chromoblastomycosis (Figure). A Gomori methenamine-silver stain was positive for fungal organisms. He returned 2 weeks later for definitive excision of the entire lesion. Pathology of the excised tissue confirmed pigmented fungal organisms consistent with chromoblastomycosis with clear surgical margins. The patient had no evidence of recurrence at a follow-up visit 6 months later.

The patient resided on 10 acres of land in Plantersville, Texas, a rural area approximately 55 miles northeast of Houston. He reported clearing brush and downed trees from his property after Hurricane Ike in September 2008 with multiple episodes of trauma to the skin. He reported travel to the Caribbean and Hawaii prior to the appearance of the lesion; however, he did not note any particular trauma to the area of skin during those travels. The patient had been in remission for several years prior to the appearance of the lesion.

Patient 2—A 64-year-old white man with a history of prostate cancer in 2003 but no evidence of recurrent



Pathology revealed pigmented fungal organisms morphologically consistent with chromoblastomycosis (H&E, original magnification ×20).

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disease presented with an erythematous plaque of 4 months' duration on his left medial ankle in January 2009. This lesion developed in the months following Hurricane Ike. On examination, a 1-cm pink plaque with superficial scale was present on the left medial ankle. A shave biopsy of the lesion was performed, revealing pigmented fungal organisms with associated pseudoepitheliomatous hyperplasia and underlying multinucleated giant cells. A Gomori methenamine-silver stain highlighted the fungal organisms. The patient returned to the clinic approximately 1 month later and underwent definitive excision of the entire lesion. Pathology of the excised tissue confirmed the presence of numerous pigmented fungal organisms with clear surgical margins.

The patient resided in Highlands, Texas, a rural area approximately 30 miles east of Houston. After Hurricane Ike in September 2008, he sustained multiple ant bites on the lower legs after clearing brush and multiple downed trees on his property. After the ant bites healed, he continued to have a persistently erythematous plaque on his left medial ankle, which prompted him to seek evaluation. This plaque intermittently developed scale, but he denied any associated itching or pain. The patient denied travel outside of the country prior to the development of the lesion. He was not being treated for cancer and was not taking any immunosuppressive medications.

Patient 3—A 74-year-old white man with a history of colon cancer in 1988 and recurrence in 2003 presented in April 2009 with a 1-cm hyperkeratotic nodule of 7 months' duration on the dorsum of the right arm that was 4 cm proximal to the elbow. Clinical examination was suspicious for squamous cell carcinoma. A shave biopsy of the lesion was performed and pathology revealed epidermal hyperplasia, a dense lymphocytic infiltrate, and pigmented fungal organisms consistent with chromoblastomycosis. The patient returned to the clinic in June 2009 for definitive excision of the entire lesion. Pathologic examination of the tissue showed a focal scar but no remaining organisms were identified.

The patient resided in Magnolia, Texas, a rural area located 40 miles northwest of Houston. He reported working outdoors on his property after Hurricane Ike clearing brush and downed trees. The patient denied travel outside of the country in the preceding months. He had been healthy prior to the appearance of the lesion with no evidence of recurrent colon cancer in the last 6 years.

Comment

Clinical infection and demonstration of chromoblastomycosis by culture was first described in São Paulo, Brazil, in 1911, and Brazil continues to have the highest number of reported cases from the American continent.[1] Other notable regions with a high incidence of reported cases include Madagascar, Venezuela, Costa Rica, and Japan. The first reported case in the United States occurred in Boston, Massachusetts, in 1915,[2] followed by a second case in Fort Worth, Texas, in 1933.[3] Located 50 miles inland from the Gulf of Mexico, Houston and the surrounding areas of southeast Texas are situated in a subtropical climate. However, reported cases of chromoblastomycosis in Texas[4-8] and other Gulf Coast regions are quite infrequent.[9-15] Our cases of chromoblastomycosis were reported in the same region following a natural disaster.

Among the species associated with chromoblastomycosis in the Dematiaceae family are *Fonsecaea pedrosoi*, *Fonsecaea compacta*, *Cladosporium carrionii*, *Cladophialophora arxii*, *Phialophora verrucosa*, *Rhinocladiella aquaspersa*, *Exophiala spinifera*, *Wangiella dermatitidis*, and *Botryomyces caespitosus*. Globally as well as in the United States, infection with *F pedrosoi* is most frequently reported.[1] The disease is more common in men who work as rural laborers in agricultural fields or wooded areas without adequate protective clothing or footwear. The most common sites of infection are the extremities, particularly the lower limbs.[16]

Following accidental inoculation of the host, the dimorphic fungus transforms into the parasitic stage consisting of round brown cells referred to as muriform cells, sclerotic bodies, or copper pennies.[17] The muriform cells then form septa that are capable of forming new muriform cells, which results in a dense fibrous reaction in the skin with a mixed granulomatous response, multinucleated giant cells, and pseudoepitheliomatous hyperplasia. The macrophages and neutrophils present in the subcutaneous tissue demonstrate frustrated phagocytosis of the muriform cells.[17] The persistence of fungal organisms in the skin eventually results in a flesh-colored or erythematous papule that may progress to a verrucous or scaly nodule or plaque.[16] If untreated, the infection progresses very slowly but may eventually form large verrucous masses or vegetations involving entire limbs. Aside from pruritus, the lesions are relatively asymptomatic and patients typically do not report pain or any other disability, resulting in a delay in diagnosis. Although hematogenous dissemination has been reported, the organisms typically are not invasive in immunocompetent patients and remain in the subcutaneous tissue.[16]

On September 13, 2008, Hurricane Ike made landfall at Galveston, Texas, as a category 2 hurricane, devastating much of the island and causing an estimated $24.9 billion in total damage to

Texas, Louisiana, and Arkansas, making it one of the costliest hurricanes in US history.[18] Most of the damage occurred on Galveston Island, Texas, and the surrounding areas including Houston. Natural disasters, such as hurricanes, have been associated with an increase in invasive mycotic infections, both with common and rare fungal organisms. Following Hurricane Katrina in 2005, a rare case of central nervous system blastomycosis was reported in a young man working outdoors on a farm that had been damaged by the hurricane near New Orleans, Louisiana.[19] *Syncephalastrum*, a fungus that rarely causes infection, was isolated in clinical specimens from 8 patients in New Orleans in the 4 months following Hurricane Katrina.[20] Hurricanes and tsunamis in particular provide additional moisture to already warm damp environments, allowing fungi to flourish. Rare forms of invasive fungal infections were reported in Sri Lanka following the 2004 tsunami.[21] Powerful storms also may stir up the soil and uproot trees and plants upon which the fungal organisms thrive, making human contact more likely. All of our patients spent time outdoors in rural areas (<60 miles outside of Houston) of Texas following Hurricane Ike. They also cleared brush and removed downed trees from their property, increasing the risk for accidental traumatic inoculation of fungal spores. Two of our patients denied travel outside of the country or to any other tropical climates in the months preceding the appearance of the lesions, making a local source of infection more likely.

The MD Anderson Cancer Center pathology database revealed only 4 other reported cases of chromoblastomycosis since 1985, with 3 of these cases sent from outside institutions for histologic review. Our patients represented a rare cluster of infections triggered by a natural disaster. Interestingly, our patients' wives and other family members also were reportedly working outdoors on their properties, yet they apparently did not acquire the infection. Each of our patients shared a history of malignancy; however, they were in remission with no evidence of immunosuppression.

Chromoblastomycosis is often clinically indistinguishable from a variety of other skin diseases such as squamous cell carcinoma, keratoacanthoma,[22] sporotrichosis, tuberculosis cutis verrucosa, leishmaniasis,[23] and cutaneous granulomatosis.[24] The lesions in our patients were clinically concerning for nonmelanoma skin cancers. Clinicians should be aware of the increased risk for unusual mycotic infections following natural disasters such as hurricanes and be vigilant in taking the appropriate diagnostic steps, especially in patients living and working in rural areas where there is an increased risk for exposure to these fungi. Although the fungal species associated with chromoblastomycosis typically are not invasive in immunocompetent hosts such as our patients, life-threatening and fatal infections have been reported in immunocompromised hosts.[25,26] Suspicious lesions should be biopsied for histologic examination of the tissue, which will reveal the typical brown muriform cells. Culture on Sabouraud dextrose agar allows for species identification.

Prompt diagnosis also is important for the treatment of chromoblastomycosis because lesions often are recalcitrant and difficult to cure using pharmacotherapy alone. Thus surgery often is the first-line treatment of small lesions. However, larger lesions may be difficult to surgically excise. These cases usually require several months of antifungal chemotherapy with agents such as itraconazole, 5-fluorocytosine, fluconazole, or terbinafine.[17] Relapse is common after medical treatment.

Conclusion

These 3 cases of chromoblastomycosis following a natural disaster should raise clinical awareness of the increased risk for rare mycotic infections associated with natural phenomena that have the ability to alter the natural habitat of certain fungi and provide a potentially ideal environment for fungal growth. Additionally, this group of infections in the same area suggests the possibility of chromoblastomycosis endemicity in the Gulf Coast areas of Texas. Clinicians should have a high index of suspicion in patients working in rural areas following natural disasters, as they have an increased risk for exposure to soil and plant species that harbor fungal spores. Any suspicious lesion should warrant prompt diagnostic and therapeutic procedures, as these lesions tend to mimic the clinical presentation of other common skin conditions.

REFERENCES

1. López Martínez R, Méndez Tovar LJ. Chromoblastomycosis. *Clin Dermatol*. 2007;25:188-194.
2. Lane CG. A cutaneous infection caused by a new fungus (*Phialophora verrucosa*) *J Cut Dis*. 1915;33:840-846.
3. Wilson SJ, Hulsey S, Weidman FD. Chromoblastomycosis in Texas. *Arch Dermatol Syph*. 1933;27:107-122.
4. Batres E, Knox JM, McGavran MH. Chromomycosis in Texas. *Tex Med*. 1979;75:59-62.
5. Gardner JT, Pace BF, Freeman RG, et al. Chromoblastomycosis in Texas. report of four cases. *Tex Med*. 1964;60:913-917.
6. Ruben HA, Bruce S, Rosen T, et al. Evidence for percutaneous inoculation as the mode of transmission for chromoblastomycosis. *J Am Acad Dermatol*. 1991;25(5, pt 2):951-954.

7. Rosen T, Overholt M. Persistent viability of the medlar body. *Int J Dermatol*. 1996;35:96-98.
8. Arnoldo BD, Purdue GF, Tchorz K, et al. A case report of phaeohyphomycosis caused by *Cladophialophora bantiana* treated in a burn unit. *J Burn Care Rehabil*. 2005;26:285-287.
9. Howles JK, Kennedy CB, Garvin WH, et al. Chromoblastomycosis: report of nine cases from a single area in Louisiana. *AMA Arch Derm Syphilol*. 1954;69:83-90.
10. Mundt LK, Moore M. Chromomycosis; report of a case from Louisiana with a discussion of its clinical and mycologic features. *New Orleans Med Surg J*. 1948;100:558-565.
11. Hamza SH, Mercado PJ, Skelton HG, et al. An unusual dematiaceous fungal infection of the skin caused by *Fonsecaea pedrosoi*: a case report and review of the literature. *J Cutan Pathol*. 2003;30:340-343.
12. Padhye AA, Hampton AA, Hampton MT, et al. Chromoblastomycosis caused by *Exophiala spinifera*. *Clin Infect Dis*. 1996;22:331-335.
13. Sevigny GM, Ramos-Caro FA. Treatment of chromoblastomycosis due to *Fonsecaea pedrosoi* with low-dose terbinafine. *Cutis*. 2000;66:45-46.
14. Greene JN, Foulis PR, Yangco BG. Chromomycosis in a steroid-dependent patient with chronic obstructive pulmonary disease. *Am J Med Sci*. 1990;299:54-57.
15. Barton K, Miller D, Pflugfelder SC. Corneal chromoblastomycosis. *Cornea*. 1997;16:235-239.
16. Lupi O, Tyring SK, McGinnis MR. Tropical dermatology: fungal tropical diseases. *J Am Acad Dermatol*. 2005;53:931-951.
17. Esterre P, Queiroz-Telles F. Management of chromoblastomycosis: novel perspectives. *Curr Opin Infect Dis*. 2006;19:148-152.
18. Berg R. Tropical cyclone report: Hurricane Ike. National Hurricane Center Web site. http://www.nhc.noaa.gov/pdf/TCR-AL092008_Ike_3May10.pdf. Updated May 3, 2010. Accessed July 15, 2009.
19. Szeder V, Ortega-Gutierrez S, Frank M, et al. CNS blastomycosis in a young man working in fields after Hurricane Katrina. *Neurology*. 2007;68:1746-1747.
20. Rao CY, Kurukularatne C, Garcia-Diaz JB, et al. Implications of detecting the mold *Syncephalastrum* in clinical specimens of New Orleans residents after Hurricanes Katrina and Rita. *J Occup Environ Med*. 2007;49:411-416.
21. Garzoni C, Emonet S, Legout L, et al. Atypical infections in tsunami survivors. *Emerg Infect Dis*. 2005;11:1591-1593.
22. Wiss K, McNeely MC, Solomon AR Jr. Chromoblastomycosis can mimic keratoacanthoma. *Int J Dermatol*. 1986;25:385-386.
23. Boudghène-Stambouli O, Mèrad-Boudia A. Chromomycosis: 2 case [in French]. *Ann Dermatol Venerol*. 1994;121:37-39.
24. Wackym PA, Gray GF Jr, Richie RE, et al. Cutaneous chromomycosis in renal transplant recipients. successful management in two cases. *Arch Intern Med*. 1985;145:1036-1037.
25. Lundstrom TS, Fairfax MR, Dugan MC, et al. *Phialophora verrucosa* infection in a BMT patient. *Bone Marrow Transplant*. 1997;20:789-791.
26. Takei H, Goodman JC, Powell SZ. Cerebral phaeohyphomycosis caused by *Cladophialophora bantiana* and *Fonsecaea monophora*: report of three cases. *Clin Neuropathol*. 2007;26:21-27.