**Case 233: Blastomycosis**

**History**
A 35-year-old man from the upper Midwest region of the United States who had no relevant medical history initially presented to an acute care clinic with multiple small tender skin lesions. His temperature was 38.1°C, and physical examination revealed several small fluctuant masses that were draining purulent material. Skin culture of one of the draining lesions was performed at this time, but there was no subsequent bacterial growth. A diagnosis of furunculosis was made, and Bactrim (sulfamethoxazole-trimethoprim; AR Scientific, Philadelphia, Pa) and a regimen of chlorhexidine washes were prescribed. Two weeks later, the number of skin lesions had increased, and the patient had begun to experience night sweats and fevers. After an episode of hemoptysis and some unusual pain in the patient’s right testicle, he presented to the emergency department. At this time, chest radiographs were obtained. The patient was admitted for additional work-up, and computed tomographic (CT) images of the chest were obtained. Physical examination at the time of admission revealed scattered 1–3-cm firm pink hyperpigmented subcutaneous nodules, several of which had overlying pustules. This examination was also notable for a palpable fullness within the right testicle. The patient was afebrile at admission. He denied a history of contact with sick people, illicit drug use, or recent travel. His social history was notable for a 20-pack-year smoking history and a recent relocation to a neighborhood with several new construction sites. Laboratory evaluation revealed leukocytosis (white blood cell count, 15.4 × 10³/L; normal range, [3.5–10.5] × 10³/L), a chemistry panel revealed a low sodium level (132 mEq/L [132 mmol/L]; normal range, 134–142 mEq/L [134–142 mmol/L]), and serum α-fetoprotein and human chorionic gonadotropin levels were normal. Ultrasonography (US) of the scrotum was performed. Serum analysis was negative for human immunodeficiency virus type 1 and type 2 RNA, and Venereal Disease Research Laboratory and rapid plasma regain test results were negative. Blood cultures were negative for bacterial growth. On the basis of chest CT findings, bronchoscopy with bronchoalveolar lavage was performed. Magnetic resonance (MR) imaging of the abdomen also was performed to further evaluate a focal area of hypoenhancement within the pancreatic tail seen on chest CT images.

**Imaging Findings**
The initial posteroanterior chest radiograph (Fig 1) showed a mass in the right upper lobe, and contrast material–enhanced (125 mL of nonionic contrast material, iohexol 350, Omnipaque; GE Healthcare, Princeton, NJ) chest CT was subsequently performed. CT (Fig 2) showed paraseptal emphysema and a large spiculated mass in the paramediastinal right upper lobe, with...
several air bronchograms and a few small satellite nodules. Several lytic osseous lesions were present in multiple thoracic vertebral bodies (not shown). MR imaging of the abdomen was performed to further evaluate the pancreatic abnormality and showed decreased intrinsic T1 signal intensity in the tail of the pancreas, with corresponding restricted diffusion (images not shown).

Scrotal US was performed because of the patient’s acute scrotal pain and imaging findings in the chest. Gray-scale and color Doppler US images showed a circumscribed intratesticular mass with associated hyperemia (Fig 3). At review of chest CT images showing the upper abdomen, an incidentally noted area of hypoenhancement was present within the tail of the pancreas (Fig 4).

Discussion
The imaging and clinical findings in this patient prompt a wide range of differential diagnoses. Given the masslike area of consolidation and the lytic bone lesions seen on chest CT images, a primary pulmonary malignancy was initially considered. In isolation, the scrotal US findings could be a neoplasm or an infection (1). Although the normal serum α-fetoprotein and human chorionic gonadotropin levels were not completely reassuring, as they lack high sensitivity and specificity, the levels would likely be elevated if the patient had widely disseminated testicular metastatic disease involving the skin, lungs, and bone (2). Other malignancies, such as primary and secondary cutaneous lymphomas, could be considered. The skin lesions typically described with mycosis fungoides are plaquelike lesions that are slowly progressive and that would not be expected to develop quickly (3). Additionally, mycosis fungoides involving the testicle is rare, with only a few cases having been reported in the literature (4). Additional rare lymphomas with secondary cutaneous involvement, such as lymphoid granulomatosis, can have necrotic skin nodules that could mimic the described lesions (3). Pulmonary involvement can occur with lymphoid granulomatosis, with reports of masslike areas of consolidation; however, the most common pulmonary manifestation is small (<1 cm) irregular nodules (5). Testicular involvement with lymphoid granulomatosis is also extremely rare, with the first case having been reported in 2012 (6). Infectious causes, such as tuberculosis, were considered given that tuberculosis can cause pulmonary disease and a wide variety of skin lesions, including tuberculosis verrucosa cutis, which can form painless plaques that ulcerate and drain pus (7). In the genitourinary system, tuberculosis epididymitis typically occurs initially and is followed by orchitis, which can manifest as a diffusely enlarged testicle, a nodular hypoechogenic testis, or multiple small mililiary nodules (8). Associated findings that could improve specificity for tuberculosis that were not present in this patient include a scrotal sinus tract, scrotal abscess, scrotal calcifications, and scrotal skin thickening (8). The lack of known exposure and underlying risk factors also make tuberculosis a less likely diagnosis. Sarcoidosis could also be considered, given the multiorgan involvement; however, genitourinary involvement is rare and occurs in only 0.2% of clinically diagnosed cases (9). Typical scrotal involvement manifests as epididymitis or multiple small hypoechoic epididymal and scrotal lesions (10). Isolated involvement of one testicle is rare (10). Skin lesions can be variable with sarcoidosis, although erythema nodosum is most commonly encountered with erythematous nodules along the extensor surfaces of the lower legs (10).

A rare infection that can affect multiple organ systems is blastomycosis, a fungal disease endemic to the Great Lakes, Southeast, and South
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Central regions of the United States along the Ohio and Mississippi rivers. The infection occurs through inhalation of the spores of the dimorphic fungus *Blastomyces dermatitidis*, which tend to proliferate in damp wooded areas. The incidence in these endemic areas has been reported to range from approximately 0.3 to 1.8 cases per 100,000 individuals (11). The primary infection involves the pulmonary system, with the possibility of hematogenous dissemination to other organ systems. Most patients will have a subclinical disease course and will remain asymptomatic as the infection goes undetected (12). In the patients who do present clinically, symptoms typically begin 6 weeks after exposure and are often nonspecific, commonly consisting of cough, fever, and night sweats. Extrapulmonary manifestations of the disease can involve nearly any organ, with the cutaneous, osseous, and genitourinary systems most frequently affected (13). Skin findings occur in up to 60% of patients with disseminated disease (14). These typically manifest as ulcerative lesions that may contain pus-tules and abscesses that spontaneously drain (15).

Most frequently, patients will have focal consolidation on chest radiographs that may mimic pneumonia or primary lung malignancy (16). CT commonly shows areas of consolidation that may be lobar or masslike (Fig 2a). Less common pulmonary findings include cavitating nodules, reticulonodular opacities, and rarely, miliary nodules (17). Satellite nodules, hilar abutment, and air bronchograms are also commonly seen but are nonspecific (18). After pulmonary and cutaneous involvement, osteoarticular and genitourinary involvement occur most frequently. Disseminated disease may involve the vertebral bodies, skull, ribs, and pelvis. Permeative or lytic lesions, as well as intervertebral disk destruction related to osteomyelitis, can occur (19). Genitourinary findings are usually related to epididymo-orchitis or prostatitis. Findings at scrotal US are nonspecific but may include hypervascularity of the testicle or epididymis, with an intratesticular hypoechoic mass simulating malignancy (Fig 3a, 3b) (20). Involvement of the central nervous system can occur in approximately 5% of patients with dis-
In this patient, bronchoscopy with bronchoalveolar lavage of the right upper lobe was performed, with no malignant cells identified. Direct visualization of the specimen revealed broad-based budding yeasts, and cultures from the right upper lobe bronchoalveolar lavage specimen and from a skin biopsy grew *Blastomyces dermatitidis*, enabling us to confirm the diagnosis. A literature review in 2000 of 936 patients reported only four cases of disseminated blastomycosis with pancreatic involvement (22). To our knowledge, a report of one case by Deutsch et al in 2007 is the only article to show imaging findings of disseminated blastomycosis in the pancreas (21). The focal unenhanced areas in the pancreas in this patient are nonspecific; however, similar findings were present in the previous case report.

The initial chest imaging findings of blastomycosis often mimic malignancy or community-acquired pneumonia, resulting in a delay in diagnosis. Current treatment for severe disseminated disease involving administration of amphotericin B followed by itraconazole is highly effective and usually results in marked improvement in clinical and imaging findings. This patient underwent treatment, with resolution of testicular findings, and subsequent chest CT images obtained approximately 2 months later showed substantial resolution of the masslike area of right upper lobe consolidation (Fig 2c). Although many of the imaging findings in this patient remain nonspecific, the overall findings combined with his demographic data are suggestive of blasto-
Blastomycosis, and it is essential to make the diagnosis as soon as possible to improve patient outcome.

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References


Congratulations to the 63 individuals and four resident groups that submitted the most likely diagnosis (disseminated blastomycosis with pancreatic involvement) for Diagnosis Please, Case 233.

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Figure 4: Axial arterial phase contrast-enhanced CT image of the upper abdomen included in the chest CT examination shows a focal area of hypoenhancement (arrows) in the pancreatic tail, best appreciated with narrow window and level settings (109 HU and 93 HU, respectively).
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