Introduction

Coccidioides immitis and Coccidioides posadasii are dimorphic fungi known to cause coccidioidomycosis (CM). These are endemic to the arid desert Southwestern United States, parts of Mexico, and Central and South America. CM is typically acquired via inhalation of infectious arthroconidia that become airborne due to the disruption of fungal-bearing soil1 (see Figure 1).

Sixty percent of patients are asymptomatic. Forty percent may demonstrate mild to moderate pulmonary disease. Approximately 1% of infections eventuate in extrapulmonary dissemination.1,2

In patients who develop extrapulmonary disease, the predominant route of coccidioidal dissemination to any site is by lymphohematogenous spread. Common sites of disseminated disease include skin, subcutaneous soft tissue, joints, bone, and the meninges of the brain and spinal cord. Lesser known sites of dissemination are endocrine glands, liver, adrenal glands, and genitourinary (GU) tract. In GU CM, the kidneys are most commonly affected.1-5 Male reproductive organs such as the prostate, testes, and the epididymis, are less commonly involved.5

Recognized at-risk groups for complicated and/or extrapulmonary CM include expectant mothers (typically in the third trimester), patients with uncontrolled diabetes or HIV disease, patients taking tumor necrosis factor-α inhibitors, and those with African American or Filipino ancestry. For GU CM, renal transplant recipients incur an additional 5% risk of disseminated coccidioidal renal disease. Renal transplant candidates should be evaluated for active mycotic disease prior to undergoing transplantation.1,4,6 All aforementioned risk groups influence disease management decisions, regarding need for treatment, antifungal dosing, and duration.1

Clinical presentation of renal parenchymal CM largely depends on the location affected and the amount of tissue destruction. Some patients may demonstrate progressive features that wax and wane over many months to years. Others may be asymptomatic. Rarely, there is a complete resolution without medical intervention.1 Renal dissemination is probably asymptomatic in many cases or results in vague symptoms. These include costovertebral angle (CVA) pain, fatigue, and urinary complaints with or without fever.1,6
follow-up is recommended every 2 years.\textsuperscript{1}

Fluid/tissue samples is required.\textsuperscript{1,7} Follow-up with aspiration and/or biopsy with cultures of magnetic resonance imaging may reveal abscess formation.

Renal CM and renal tuberculosis.\textsuperscript{1} The noted features in some reports have noted radiographic similarities between distinguishable from other renal parenchymal diseases, although a broad range of presentations. They are relatively indistinguishable from other renal parenchymal diseases, although some reports have noted radiographic similarities between renal CM and renal tuberculosis.\textsuperscript{1} The noted features in common include, but are not limited to, feathery, moth-eaten calices, infundibular constriction, and caliceal ballooning with eventual calcification of granulomas.\textsuperscript{6} Imaging with CT or magnetic resonance imaging may reveal abscess formation. Follow-up with aspiration and/or biopsy with cultures of fluid/tissue samples is required.\textsuperscript{1,7}

Treatment is necessarily protracted. A 3-year minimum is recommended. Azoles, typically fluconazole, are the first line of therapy. Serologic response may be slow.\textsuperscript{1,5} Posttreatment follow-up is recommended every 2 years.\textsuperscript{1}

Methods

Approval was obtained from the Institutional Review Board of Kern Medical. A retrospective review of the patient’s record was performed. A literature search was conducted on PubMed, Research Gate, Google Scholar, Centers for Disease Control and Prevention, Infectious Diseases Society of America’s Clinical Infectious Diseases Journal database, and American Urologic Association’s The Journal of Urology database. The following search terms were applied: coccidioidomycosis, genitourinary coccidioidomycosis, renal coccidioidomycosis, renal parenchymal coccidioidomycosis, and disseminated GU coccidioidomycosis.

Case Report

A 52-year-old Hispanic man with diabetes mellitus was diagnosed with primary cavitary CM at another institution. He was an oil field worker in the San Joaquin Valley of California. Four years after his initial diagnosis, he was hospitalized at an outside institution for CM exacerbation with a ruptured cavitary lesion (coccidioidal empyema). He underwent video-assisted thoracoscopic surgery. His hemoglobin A1c at that time was 15%. He presented to our institution 1 month later with severe lower back pain. He had fatigue and unintentional weight loss of 20 pounds.

On physical examination, his vital signs were 36.4 °C temperature, heart rate 76 beats per minute, respiratory rate 24 breaths per minute, and blood pressure 153/98 mm Hg. His oxygen saturation was 99% on room air. The physical examination only was positive for left CVA tenderness.

Laboratory examination revealed mild eosinophilia (absolute eosinophil count 383 cells/µL) and elevated inflammatory markers such as C-reactive protein and erythrocyte sedimentation rate.\textsuperscript{1,8}

Less commonly, urine specimens are examined for coccidioiduria.\textsuperscript{3,4} In a patient without upper or lower urinary tract complaints, it is not typical to obtain fungal urine cultures for routine screenings. Reference guidelines do not comment either way on performing fungal urine culture screenings in primary and/or disseminated CM in the absence of GU symptoms. Positive urine cultures that demonstrate evidence of CM require follow-up imaging of the upper and lower GU tract.\textsuperscript{1,2,4,5,7}

Computed tomography (CT) of the abdomen and pelvis with intravenous contrast or retroperitoneal ultrasound is recommended.\textsuperscript{1} Renal CM radiographic findings have a broad range of presentations. They are relatively indistinguishable from other renal parenchymal diseases, although some reports have noted radiographic similarities between renal CM and renal tuberculosis.\textsuperscript{1} The noted features in common include, but are not limited to, feathery, moth-eaten calices, infundibular constriction, and caliceal ballooning with eventual calcification of granulomas.\textsuperscript{6} Imaging with CT or magnetic resonance imaging may reveal abscess formation. Follow-up with aspiration and/or biopsy with cultures of fluid/tissue samples is required.\textsuperscript{1,7}

Computed tomography (CT) of the abdomen and pelvis imaging demonstrated a 15 × 11 × 16 cm left renal mass with cystic and solid components within the nephric and perinephric space (see Figure 2). Fluoroscopic-guided drainage of 800 cc of purulent fluid surrounding the left kidney was performed by interventional radiology as an outpatient procedure. Aspirate grew C immitis.

CM dissemination to the left kidney was diagnosed based on histopathologic evidence of CM. Antifungal therapy was initiated with 800 mg of oral fluconazole once daily. A nephrectomy was initially considered. The decision was deferred to allow time for observation of the patient’s clinical response to antifungal therapy. A pigtail catheter and nephrostomy were inserted. The patient reported relief of his CVA pain.

Figure 1. Photomicrograph of coccidioides arthroconidia.\textsuperscript{2}
noted at autopsy. He is an at-risk patient with uncontrolled
Based on our extensive literature review prior cases were
as a disseminated coccidioidal disease in a living patient.
This is the first reported case of renal parenchymal abscess
Discussion
One month later, the patient was admitted due to decreased
urinary stream from the nephrostomy and recurrent lower
back pain. CT of the abdomen and pelvis revealed displace-
ment of his pigtail catheter and nephrostomy. The nephro-
stonomy conduit and pigtail catheter were repositioned by
interventional radiology, and proper drainage was confirmed.
The patient’s lower back pain improved. He was discharged
home and monitored closely in the clinic. His pigtail catheter
was removed at 6 months of therapy. Nephrostomy tube was
removed at 7 months of therapy.
Renal function throughout his entire course of CM before
(glomerular filtration rate [GFR] = 70 mL/min), during
(GFR = 58 mL/min), and after (GFR = 77 mL/min) antifun-
gal therapy was preserved most of the time.
He remained adherent to antifungal therapy (oral flucon-
azole 800 mg daily) for 36 months. His coccidioidal comple-
ment fixation (CF) serum titers improved from 1:<512 to
<1:2. Fluconazole levels were monitored regularly. His coc-
cidioidal left renal abscess completely resolved as demon-
strated by clinical improvement and radiographic evidence.
Antifungal therapy was discontinued as planned at the end of
the 36th month.
The patient was instructed to maintain sequential follow-
up visits for routine evaluation of serum coccidioidal CF
titers. His last 2 years of follow-up visits revealed CF titers
<1:2. He was later lost to follow-up.

Figure 2. Computed tomography of the abdomen and pelvis with
intravenous contrast of the actual patient showing heterogeneous
left-sided renal abscess (15 × 11 × 16 cm) with nephric and
perinephric fluid accumulation indicated by red arrows.

Discussion
This is the first reported case of renal parenchymal abscess
as a disseminated coccidioidal disease in a living patient.
Based on our extensive literature review prior cases were
noted at autopsy. He is an at-risk patient with uncontrolled
diabetes. Symptoms were vague; his physical examination
revealed CVA tenderness. His routine laboratory test was
unremarkable except for borderline eosinophilia. Imaging
was nonspecific. The elevated coccidioidal serologies could
be easily attributed to his pulmonary coccidioidomycosis.
The aspirate and the identification of C immitis by stain and
culture made the diagnosis. The management plan was
developed from experience with the treatment of other dis-
seminated disease.
An autopsy series from 1975 stated dissemination to the
kidney was the sixth most common site for extrapulmonary
coccidioidomycosis. Autopsy analysis of 50 subjects with
coccidioidal-related deaths were studied in this report.6 Two
autopsy series from the 1980s described renal coccidioidal
involvement in 35% to 60% of patients with fatal disease.
The renal parenchyma, prostate, epididymis, and the urinary
bladder have been described as known sites of involvement
in chronic CM and fatal-disseminated disease.3
The Centers for Disease Control and Prevention acknowl-
edges that the total number of CM cases reported are likely
underestimated.2 Tens of thousands of cases are probably
missed each year due to misdiagnosis. In highly endemic
areas such as the San Joaquin Valley of California and south-
western Arizona, CM is a rising cause of community-
acquired pneumonias, but low testing rates suggest that CM
is probably underrecognized. The true incidence of CM
involvement with the GU system is largely unknown.1,2,4,5
Weinberg et al,3 in 1984, reported that coccidioidouria
occurs in patients with disseminated disease and rarely in
primary pulmonary disease. The authors reported that urine
specimens are seldom examined, and for this reason, GU CM
has possibly been underestimated.3
Due to the paucity of cases, specific strategies for the treat-
ment of disseminated CM to the renal parenchyma does not
exist. Although recommendations cannot address every indi-
vidual variation among patients in CM, this case demonstrates
that oral azole antifungals may provide an adjunctive or alter-
native to surgical intervention for CM of the GU tract.
Nephrectomy was considered but not required. Management
was followed for soft tissue dissemination to a solid organ.
See guidelines by the Infectious Diseases Society of America.1
The success in this case of renal CM with 36 months of
oral azole therapy and renal abscess drainage may not be
applicable to all cases.
Prospective trials for soft tissue coccidioidomycosis
reported response rates to azole therapy ranging from 25% to
91% for disseminated disease. Of these, 60% relapsed within
45 days after cessation of therapy. Eleven percent relapsed
12 months after cessation of therapy.1 There are no trials
comparing AmB with oral azole therapy.1
The actual incidence of renal CM is currently unknown.
It may be an asymptomatic manifestation or with vague
upper and/or lower GU symptoms. The disease may not be
revealed by blood or urine analysis. Anatomical seeding and
subsequent local destruction affect disease presentation
clinically and radiographically.3,5
Expert opinion may be the only resource available for treatment recommendations as in this case. It was decided at the Valley Fever Institute to administer antifungal therapy with fluconazole for a duration of 36 months in which a salutary result was achieved.

Authors’ Note
This case has been proudly presented at the American Federation of Medical Research’s Western Conference, January 2018, as well as the Coccidioidomycoses Study Group conference of 2018.

Declaration of Conflicting Interests
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Ethics Approval
Ethical approval to report this case was obtained from the Kern Medical Institutional Review Board (Approval ID: 17076).

Informed Consent
Informed consent for patient information to be published in this article was not obtained because he was lost to follow-up.

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