Mycetoma is an infectious, noncontagious disease caused by free-living bacteria (actinomyctoma) or fungi (eumycetoma) that are traumatically implanted into the body.1 In humans, the hand and foot are the most commonly affected sites and involvement of the abdominal wall or viscera is rare.1–3 Causal agents of mycetoma produce organized aggregates of bacteria or fungal hyphae called grains in affected tissue.1 Clinically, the 3 distinguishing features of mycetoma are formation of nodular inflammatory lesions with secondary fibrosis, formation of fistulae that may penetrate deep tissue, and the presence of bacterial or fungal grains in the affected tissue and exudate.4 The initial lesion of mycetoma is typically a painless scratch or small papule.4 Because little discomfort is associated with early lesions, mycetomas are usually insidious, and patients generally present late with advanced disease.5 As the disease progresses, affected tissue is replaced by a tumorous mass of chronic inflammation and fibrosis that may clinically resemble neoplasia.1

Dermatophytes may rarely invade deep cutaneous tissue to produce mycetomalike, nodular or dispersed, supplicative and granulomatous, inflammation of the dermis and subcutis.5 The dermatophytes within these lesions may aggregate into clusters that resemble the tissue grains of eumycetoma. These clusters of dermatophytes are not considered to be true grains because individual fungal elements may often be found in the tissue as well.1 Therefore, some prefer the term pseudomyctoma to distinguish the dermatophytic lesions from those of other fungal mycetomas.1,5,6 In humans, pseudomyctoma has been caused by species of the genera Microsporum (M canis, M audouinii), and M ferrugineum and Trichophyton (T mentagrophytes, T rubrum, T tonsurans, and T violaceum).5 Systemic dermatophytosis is extremely rare and resembles other deep infections caused by fungi such as Aspergillus sp.5 Definitive identification of the causal agent of mycetoma or pseudomyctoma is best done through characterization of the organism in culture.1 Immunohistochemical identification of fungi, including dermatophyte species, is possible but not widely available.5,7

Mycetoma in the cat is rare, but feline cases of eumycetoma and actinomyctoma have been reported.10–12 None of these cases were associated with lesions of body cavities. Several reports have been made of intra-abdominal eumycetoma in dogs.13–17 Intra-abdominal masses were identified in all cases, and some dogs also developed 1 or more fistulae along the ventral midline of the abdominal wall.13,16,17 In 4 of these cases, female dogs developed intra-abdominal eumycetoma months to years after dehiscence of an abdominal surgical wound after ovariohysterectomy15–17 or cesarean section.14 In these dogs, dehiscence may have allowed the peritoneum and abdominal organs to be infected with fungi from the environment. One case of intra-abdominal eumycetoma in a male dog appeared to result from migration of fungus-infected plant material from the intestine.13

Reports of dermatophytic mycetomalike lesions in animals are rare. To date, such reports are limited to cases of dermal nodular dermatothyosis, or dermatophytic pseudomyctoma, caused by M canis or Trichophyton sp in Persian cats.19–24 Affected cats present with raised cutaneous nodules, usually on the back or base of the tail, that may ulcerate or drain.20,21 Microscopically, the nodules are composed of granulomatous inflammation with multinucleated giant cells, lymphocytes, and neutrophils in the dermis or deeper tissues.20,24 Embedded within the inflammatory reaction are aggregates of hyaline, septate, branching hyphae with thick-walled vesicles.20 The fungi may be surrounded by amorphous eosinophilic material (Splendore-Hoeppli reaction).24 The overlying skin may exhibit typical follicular dermatophytosis with or without inflammation.24 We describe a case of dermatophytic pseudomyctoma within the abdominal cavity of a cat diagnosed by ultrasonography and immunohistochemical staining.

A 7-year-old spayed female Persian cat with chronic weight loss of 15 months duration was examined at a private veterinary clinic. The owner estimated that the cat had lost 50% of its body weight, with the majority of the weight loss occurring over the 3 months before presentation. Additional clinical signs observed by the owner included lethargy, dullness and matting of the hair coat, intermittent diarrhea, and dysuria characterized by dribbling of the urine stream. The cat lived exclusively indoors and was on a diet of commercial canned and semimoist foods. The cat’s feline immunodeficiency virus (FIV), feline leukemia virus (FeLV), and vaccination statuses were unknown. Previous medical problems included dermatophytosis at 6 weeks of age (the causative dermatophyte was unknown) and vaginal prolapse and ovariohysterectomy at 6 months of age. During the physical examination, a caudal abdominal mass was identified by palpation. A ventral midline laparotomy of the caudal abdomen was performed and the caudal abdominal cavity was explored. A 2 × 4-cm, poorly defined, firm,
A grayish white mass was found to be firmly attached to the internal surface of the abdominal wall in the left inguinal area. Numerous smaller masses were scattered in the omentum and on the capsule of the spleen. A tentative diagnosis of intra-abdominal neoplasia was made, and some of the omental masses were excised, fixed in 10% formalin, and submitted for histopathology to Diagnostic Laboratory Services at Mississippi State University’s College of Veterinary Medicine (MSU-CVM). The cat made an uneventful recovery from surgery.

One week after the laparotomy, the cat was referred to the MSU-CVM Animal Health Center for further evaluation. Physical examination revealed an emaciated (1.8-kg) but bright and alert cat with normal temperature, pulse, and respiration. The cat had a bilateral mucoid ocular discharge and dull hair coat. The previously identified intra-abdominal mass in the left side of the caudal abdomen was palpated, and a 2nd firm intra-abdominal mass, 6–10 cm in diameter, was palpated in the cranial abdomen. The 2nd mass may have been missed during the prereferral exploratory laparotomy, in which primarily the caudal abdominal cavity was investigated. A percutaneous needle aspirate and cytology of the caudal abdominal mass revealed pyogranulomatous inflammation. The owner declined testing the cat for FIV and FeLV, but radiography and ultrasonography were allowed.

No abnormalities were identified in radiographs of the cat’s thorax. Abdominal radiographs revealed loss of serosal detail consistent with depletion of body fat. The right kidney appeared normal, but the left kidney was not identifiable. The cranial abdominal mass was in the left side of the abdomen and was of soft tissue density; the mass caused cranial and ventral displacement of the small bowel and ventral displacement of the colon. The caudal abdominal mass was of soft tissue density and distorted the left caudal abdominal wall.

Ultrasonography of the abdomen revealed a normal right kidney and a hydrenephrotic left kidney with a very thin cortex. The cranial abdominal mass seemed to be a single thick-walled cavity filled with fluid containing mixed echogenic material that gravitated; these findings were consistent with an abscess. The caudal abdominal mass was thick-walled and contained multiple, uniformly distributed, hyperreflective foci less than 5 mm in diameter (Fig 1). Some of these foci produced profound attenuation of the ultrasound beam and suggested mineralization.

Histologic examination of the omental masses collected during the initial laparotomy revealed 5- to 7-mm-diameter masses composed of reactive fibrous connective tissue and numerous foci of granulomatous, lymphocytic, and neutrophilic inflammation containing discrete, spherical to multilobular grainlike aggregates of nonpigmented (hyaline) fungal hyphae. The fungal aggregates were up to 700 μm in width and were composed of dense clusters of narrow branched septate hyaline fungal hyphae (Fig 2). Gomori’s methenamine silver stain allowed better visualization of hyphae within the aggregates (Fig 3). The hyphae contained numerous vesicular swellings at the periphery of the aggregates, and focal calcification was present within some aggregates. The fungal aggregates corresponded to the small hyperreflective foci identified by ultrasonography in the caudal abdominal mass.

The mass lesions of inflammation and fibrosis containing grainlike aggregates of hyaline fungal hyphae were characteristic of white (nonpigmented or hyaline) grain eumycetoma. Because fresh tissue was not available for fungal culture to identify the etiologic agent, paraffin sections of the omental masses were stained immunohistochemically
Pseudomycetoma in a Cat

Fig 2. Photomicrograph of intra-abdominal pseudomycetoma in a cat; grainlike aggregates of hyaline fungal hyphae are surrounded by granulomatous, lymphocytic, and neutrophilic inflammation and reactive fibrous tissue. Hematoxylin and eosin stain. Bar = 100 μm.

by a peroxidase antiperoxidase technique7 with a panel of mono- and polyclonal antibodies reacting specifically with the etiologic agents of aspergillosis, candidosis, cryptococcosis, dermatophytosis, fusariosis, scedosporiosis (pseudallescheriosis), geotrichosis, and zygomycosis.8-10 Reactivity of fungal elements in this case was obtained only by a heterologously absorbed, dermatophyte-specific antibody raised against Trichophyton mentagrophytes. In control sections, this antibody reacted strongly with T mentagrophytes, T verrucosum, and Microsporum canis. Therefore, the etiology of the intra-abdominal fungal infection was determined to be a dermatophyte of either Trichophyton or Microsporum species.

The final diagnosis was disseminated intra-abdominal dermatophytic pseudomycetoma with unilateral hydronephrosis and presumptive intra-abdominal abscess. Because of the poor prognosis and financial constraints, the owner declined further diagnostics and a therapeutic trial of itraconazole. Within 3 weeks of discharge from the hospital, the cat died. A postmortem examination was not allowed.

The source of intra-abdominal dermatophyte infection in this Persian cat is unknown. Feline dermatophytic pseudomycetoma is a disease that seems to be unique to Persian cats.20,21,24 Because dermatophytosis in this cat was diagnosed before ovariohysterectomy, it is tempting to speculate that the peritoneal cavity was contaminated as a complication of abdominal surgery associated with ovariohysterectomy, a recognized portal of entry in dogs developing intra-abdominal eumycetoma.15-17 If this is true, the intra-abdominal dermatophyte infection was present in this cat for several years. The functional status of the cat’s immune system was unknown, and as in a previous case of dermal dermatophytic pseudomycetoma in an FIV-positive Persian cat,20 retrovirus-associated immunosuppression may have played a role in this case.

Recently, ultrasonographic imaging of mycetoma in humans has proven to be of diagnostic and prognostic value, as determined in a study of the ultrasonographic appearance of 100 mass lesions of the foot in humans.25 In this study, investigators found that mycetoma had characteristic ultrasonographic features that clearly distinguished it from other tumorous lesions. Specifically, grains within eumycetoma and actinomycetoma appeared as numerous sharp or fine hyperreflective echoes, respectively. None of the nonmycetoma masses (neoplasms and foreign body granulomas) contained similar hyperreflective echoes. Ultrasonography
also enhanced the ability to more accurately delineate the extent of mycetoma. Ultrasonography of the caudal abdominal mass in this cat revealed numerous small hyperreflective foci within the mass that were comparable to those described in human mycetoma.

Actinomycetoma may respond to antibiotic treatment. In contrast, treatment of eumycetoma is often ineffective and consists of surgical excision or amputation, debridement, and antifungal therapy. Eumycetoma in dogs did not respond to treatment with ketoconazole or fluconazole. Some success in treatment of eumycetoma in humans has been achieved with amphotericin B, itraconazole, and ketoconazole. Regional intra-arterial administration of desmoplastic pseudomyxoma has recently been suggested as an alternative to systemic therapy. Surgical excision of dermal lesions has not prevented recurrence of dermatothropic pseudomyxoma in cats, and results of treatment with griseofulvin, ketoconazole, and itraconazole have been variable. Complete surgical excision of pseudomyxoma was not an option in the present case because of apparent dissemination of the lesions within the cat’s periportal cavity. This case was further complicated by unilateral hydronephrosis and a presumptive intra-abdominal abscess in the cranial abdomen. Hydronephrosis may have been secondary to involvement of the left ureter by inflammatory lesions in the abdomen.

Mycetoma and pseudomyxoma, although rare, should be considered in the differential diagnosis for mass lesions in animals. Ultrasonography may provide a noninvasive method of differentiating these conditions from other inflammatory lesions and neoplasia. If suspect lesions are biopsyed for histopathology, it is important that fresh tissue also be submitted for bacterial and fungal cultures. Immunohistochemical staining may be used to identify pathogenic fungi, including dermatophytes, in tissue sections. Intra-abdominal pseudomyxoma may be a rare complication of laparotomy in animals with cutaneous dermatophytosis, particularly in Persian cats.

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