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### Note

## Intra-abdominal fungal pseudomycetoma in two cats



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### ABSTRACT

**Background:** Pseudomycetomas are deep cutaneous to subcutaneous lesions caused by *Microsporum canis* mainly described in Persian cats, with few reports of intra-abdominal location. This report describes the clinical signs and lesions of intra-abdominal pseudomycetomas caused by *M. canis* in two Persian cats. **Case report:** Two Persian cats with a history of previous laparotomy (ovariohysterectomy and nephrostomy) and fecal impaction were examined. Cat #1 was euthanized and subjected to necropsy, histopathology and mycological evaluation. Cat #2 presented with chronic dermatophytosis, and an intra-abdominal mass, that was subjected to histopathology evaluation. Cat #1 presented at necropsy a white-grayish, firm mass (6 cm × 3.5 cm × 2.8 cm) in the uterine cervix. Cat #2 presented a firm whitish mass (6.5 cm × 1.5 cm × 0.5 cm) located close to the left kidney. Histologically, both masses contained multifocal granules with hyphae and spores surrounded by Splendore-Hoeppli reaction, with a pyogranulomatous inflammatory infiltrate and fibrous connective tissue proliferation in the periphery. Hyphae and spores exhibited marked Grocott and periodic acid-Schiff staining. *M. canis* was identified by fungal isolation in cat #1.

**Conclusions:** Pseudomycetoma should be considered as a differential diagnosis in cats, especially in Persian cats presenting with an intra-abdominal mass. Entrance of the agent into the cavity can occur during laparotomy.

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## Pseudomicetoma intraabdominal fúngico en dos gatos

### RESUMEN

**Antecedentes:** Los pseudomicetomas son infecciones cutáneas o subcutáneas causadas por *Microsporum canis*. Se presentan con mayor frecuencia en los gatos persas, pero existen pocas publicaciones sobre la localización intraabdominal. Este trabajo describe los signos clínicos y las lesiones por pseudomicetomas intraabdominales causados por *M. canis* presentes en dos gatos de raza persa.

**Caso clínico:** Se examinó el estado de dos gatos persas que presentaban como antecedentes la realización de una laparotomía reciente (ovariohisterectomía y nefrostomía) y la existencia de fecaloma. El gato 1 fue eutanasiado y se realizaron exámenes de necropsia, histopatológicos y micológicos. El gato 2 presentaba dermatofitosis crónica y una masa intraabdominal que se envió para examen histopatológico. El gato 1 presentaba en la necropsia una masa firme, blanca grisácea (6 × 3,5 × 2,8 cm), en el cuello del útero. El gato 2 presentaba también, en este caso cerca del riñón izquierdo, una masa firme y blanca (6,5 × 1,5 × 0,5 cm). Histológicamente ambas masas estaban compuestas por gránulos multifocales con

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hifas y esporas, rodeadas por la reacción de Splendore-Hoepli, un infiltrado inflamatorio granulomatoso y proliferación del tejido conectivo fibroso en la periferia. Las hifas y esporas fueron teñidas mediante las tinciones de Gomori-Grocott y ácido peryódico de Schiff. El aislamiento obtenido en el gato 1 fue identificado como *M. canis*.

**Conclusiones:** En los gatos debe considerarse el pseudomicetoma en el diagnóstico diferencial, especialmente en aquellos de raza persa que presentan masas intraabdominales. La entrada del agente en la cavidad puede tener lugar durante la laparotomía.

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In cats, dermatophytic pseudomycetoma (DP) is a deep cutaneous to subcutaneous, uncommon, fungal infection typically caused by *Microsporum canis*.<sup>7,11,14,17,18,20</sup> This condition was first described by Bourdin et al.,<sup>5</sup> and the associated lesion is characterized by the production of granules composed of fungal aggregates embedded in Splendore-Hoepli reaction,<sup>10</sup> surrounded by pyogranulomatous or granulomatous inflammation.<sup>1</sup> DP has been described in cats,<sup>3,9,13,15,16</sup> but has rarely been reported in dogs.<sup>1</sup> Persian cats have an increased predisposition to DP,<sup>7,10,11,14,15,19,20</sup> which may reflect immunodeficiency or an aberrant immune response to the fungus.<sup>12</sup> Additionally, carriage of *M. canis* is frequent in cats, and it is the most common dermatophyte isolated from felines with dermatophytosis.<sup>6,8</sup>

In cats, DP lesions are usually located on the skin of dorsal thorax,<sup>10,11</sup> neck,<sup>4</sup> axilla,<sup>7</sup> tail,<sup>14</sup> ventral thorax and/or abdomen.<sup>7</sup> However, sublumbar,<sup>16</sup> intra-abdominal<sup>3,9,19</sup> and regional lymph nodes pseudomycetomas<sup>7,18</sup> have also been reported. This report describes the clinical signs, gross and histopathological findings of intra-abdominal pseudomycetomas caused by *M. canis* in two Persian cats.

One of the cats (cat #1) was a five-year-old spayed Persian female that had undergone ovariohysterectomy four months before. The cat had a recent history of fecal impaction, dyschezia and tenesmus. Clinical treatment consisted of enema and supportive care; however, the fecal impaction relapsed a month later. Euthanasia was performed due to the deteriorating quality of life and poor prognosis.

The other cat (cat #2) was a seven-year-old neutered Persian male with a history of nephrostomy for calculus removal three months before. This cat presented chronic recurrent dermatophytosis that was treated with ketoconazole. On physical examination, marked cachexia and dyschezia were observed. Abdominal ultrasonographic examination revealed a mass (4.9 cm × 3.1 cm × 2.7 cm), cranial to the urinary bladder, with a heterogeneous echotexture. This animal was then subjected to an exploratory laparotomy. A fecaloma was detected in the large intestine, and a multilobulated, whitish, firm mass (6.5 cm × 1.5 cm × 0.5 cm) was also found close to the left kidney. Biopsy was performed, and the samples were submitted for histopathological evaluation. The cat's clinical condition worsened after seven days, resulting in death; however, necropsy was not performed.

Cat #1 was necropsied, and multiple tissues were collected, while only a biopsy sample was available from cat #2. The samples from both cats were fixed in 10% neutral buffered formalin solution, processed routinely, and stained with hematoxylin and eosin (HE). Sections of the masses from both cats were also stained with Gomori-Grocott methenamine silver (GMS) and periodic acid-Schiff (PAS). Fungal isolation was achieved by seeding the abdominal mass samples from cat #1 in Sabouraud glucose agar with chloramphenicol and cycloheximide followed by incubation at 26 °C for seven days. Identification of *M. canis* was based on macroscopic and microscopic features, such as the typical colonies

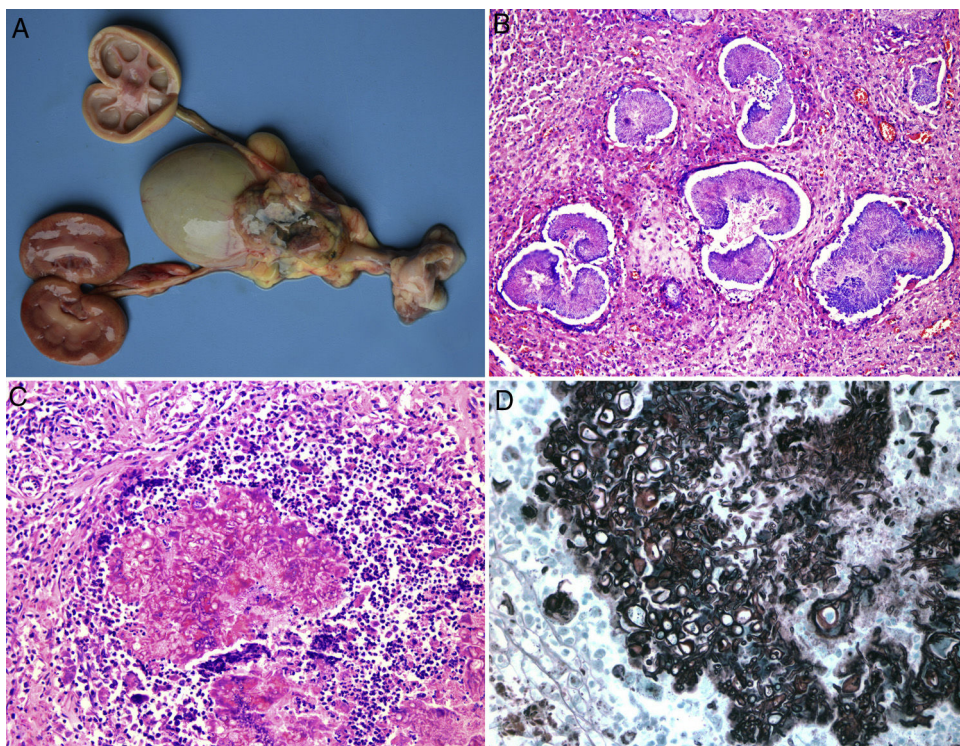
and long, spindle-shaped, verrucous, thick-walled macroconidia, most of which had a terminal knob.

At necropsy of cat #1 a white-grayish, irregular, firm mass (6 cm × 3.5 cm × 2.8 cm) was found in the uterine cervix, with urinary bladder adhesions and right ureter occlusion. The right kidney presented with severe dilatation of the renal pelvis containing urine (hydronephrosis) (Fig. 1A). The colon was severely distended due to the presence of a fecaloma.

Histological evaluation of both masses (cats #1 and #2) revealed multifocal, amorphous aggregates (granules) with refractile and pleomorphic, branched and septated fungal hyphae intermixed with numerous clear bulbous dilatations (Fig 1B). These fungal structures were surrounded by an amorphous eosinophilic material (Splendore-Hoepli reaction). A pyogranulomatous inflammatory infiltrate was observed at the periphery of the granules; numerous epithelioid macrophages, a moderate amount of multinucleated giant cells and few degenerated neutrophils were described. Moderate fibrous connective tissue proliferation surrounding these inflammatory cells was also observed (Fig 1C). In addition, numerous branched and septate hyphae with vesicles located in intensely stained granules were positive for both GMS (Fig 1D) and PAS staining.

Diagnosis of the two Persian cats with intra-abdominal pseudomycetoma was based on the clinical, gross and histopathological findings, in addition to the identification of the fungus in one of them. DP is a deep cutaneous to subcutaneous lesion that occurs occasionally in cats, especially those of the Persian breed,<sup>10</sup> which was the breed of the cats in the present study. Intra-abdominal pseudomycetoma is rarely described in cats,<sup>3,9,19</sup> and their origin is still uncertain. However, Ferro et al.<sup>9</sup> described a case of intra-abdominal pseudomycetoma in a cat that most likely originated from the skin, due to the presence of a fistulous tract connecting the abdominal cavity with the skin. Other possible routes of entry of this agent are related to traumatic implantation<sup>7,10</sup> and contamination during abdominal surgery.<sup>3</sup> The cats in the present study did not present cutaneous or subcutaneous nodular lesions compatible with pseudomycetoma and, moreover, neither cat had a history of previous trauma. However, as the lesions in both cats were located close to anatomical structures related to previous surgical procedures (the uterine cervix and kidney), the introduction of the agent into the abdominal cavity likely occurred via contamination during laparotomy. Cat #2 had a history of dermatophytosis, which may have favored the introduction of this fungus into the abdominal cavity during the surgical procedure (nephrostomy), as previously described.<sup>3</sup> Cat #1 had not presented with cutaneous lesions previously, suggesting that it might have been an asymptomatic carrier of *M. canis*, which is a common situation in Persian cats.<sup>8,10</sup>

Clinically, constipation and tenesmus were observed in both cats, similar to previous descriptions.<sup>3,16,19</sup> These clinical signs were related to the expansive growth of the masses in both cats, which caused compression and obstruction of the large intestine. Likewise, the hydronephrosis observed in cat #1 was related to



**Fig. 1.** Intra-abdominal fungal pseudomycetomas in two cats. (A) Cat #1. White-grayish irregular mass (6 cm × 3.5 cm × 2.8 cm) in the uterine cervix, with urinary bladder adhesions and right ureter occlusion. The right kidney exhibited severe dilatation of the renal pelvis (hydronephrosis). (B) Cat #2. The mass was composed of multifocal, amorphous aggregates (granules) intermixed with marked pyogranulomatous inflammation and fibrous connective tissue proliferation. HE, 10×. (C) Cat #1. The granules contained numerous refractile pleomorphic fungal hyphae and clear bulbous dilations surrounded by an amorphous eosinophilic material (Splendore-Hoeppli reaction). At the periphery of these granules, an inflammatory infiltrate composed of numerous epithelioid macrophages, a moderate amount of multinucleated giant cells and mild degenerate neutrophils was observed, in addition to moderate fibrous connective tissue proliferation. HE, 20×. (D) Cat #2. The hyphae within the granules were branched and segmented, and they contained clear bulbous dilations (spores). GMS, 20×.

compression of the right ureter by the intra-abdominal mass and consequent urinary retention.

The histopathological findings in both cases were characteristic of pseudomycetomas.<sup>10</sup> They possess several remarkable features, including numerous mycelial elements, abundant Splendore-Hoeppli reaction, fewer hyphal elements and absence of cementing substance,<sup>2</sup> as in the present study. The cells composing the inflammatory infiltrate, and mainly the fibrous connective tissue proliferation, suggest that the lesions were chronic, with an evolution of three to four months, as described by Black et al.,<sup>3</sup> in which an intra-abdominal fungal infection had been present for many years.

The characteristics of the fungal structures observed on histochemical evaluation, and mainly the gross and microscopic features observed in the fungal culture (cat #1), confirm that *M. canis* was the etiologic agent of these lesions. Histopathological analysis and fungal culture are essential for characterizing lesions and identifying the causative agents, respectively, and can be used in differential diagnosis from mycetoma.<sup>3,9</sup>

Pseudomycetoma caused by *M. canis* may present as an intra-abdominal mass and should be considered as a differential diagnosis in cats, especially those of the Persian breed. The clinical findings and the lesion locations of the cats in this study reinforced the hypothesis that the fungus had entered into the cats' abdominal cavity during the abdominal surgical procedures. Thus, careful pre-surgical screening for skin lesions in cats should be a constant routine to avoid the contamination of the abdominal cavity during surgical procedures and the consequent development of pseudomycetoma.

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## References

1. Abramo F, Vercelli A, Mancianti F. Two cases of dermatophytic pseudomycetoma in the dog: an immunohistochemical study. *Vet Dermatol*. 2001;12:203–7.
2. Ajello A, Kaplan W, Chandler FW. Dermatophyte mycetoma: fact or fiction? *Proceedings of the 5th International Conference on Mycosis*, vol. 396. 1980. p. 135–40.
3. Black SS, Abernethy TE, Tyler JW, Thomas MW, Aviña AG, Jensen HE. Intra-abdominal dermatophytic pseudomycetoma in a Persian cat. *J Vet Intern Med*. 2001;15:245–8.
4. Bond R, Pocknell AM, Toze CE. Pseudomycetoma caused by *Microsporium canis* in a Persian cat: lack of response to oral terbinafine. *J Small Anim Pract*. 2001;42:557–60.
5. Bourdin M, Destombes P, Parodi AL, Drouhet E, Segretain G. Première observation d'un mycétome à *Microsporium canis* chez un chat. *Rec Méd Vét*. 1975;151:475–80.
6. Cabañes FJ. Dermatophytes in domestic animals. *Biology of dermatophytes and other keratinophilic fungi*, vol. 17. Rev. Iberoam. Micol.; 2000. p. 104–8.
7. Chang SC, Liao JW, Shyu CL, Hsu WL, Wong ML. Dermatophytic pseudomycetomas in four cats. *Vet Dermatol*. 2010;22:181–7.
8. Chermette R, Ferreiro L, Guillot J. Dermatophytosis in animals. *Mycopathologia*. 2008;166:385–405.
9. Ferro S, Vasconi E, Castagnaro M. A case of intra-abdominal pseudomycetoma in a short hair domestic cat. *Veterinaria*. 2008;22:35–41.
10. Gross TL, Ihrke PJ, Walder EJ, Affolter VK. *Skin diseases of the dog and cat: clinical and histopathologic diagnosis*. 2nd ed. Blackwell Science; 2005.
11. Miller RI. Nodular granulomatous fungal skin diseases of cats in the United Kingdom: a retrospective review. *Vet Dermatol*. 2009;21:130–5.

12. Miller WH, Goldschmidt MH. Mycetomas in the cat caused by a dermatophyte: case report. J Am Anim Hosp Assoc. 1986;22:255–60.
13. Nardoni S, Franceschi A, Mancianti F. Identification of *Microsporum canis* from dermatophytic pseudomycetoma in a paraffin-embedded veterinary specimens using a common PCR protocol. Mycoses. 2007;50:215–7.
14. Nobre MO, Mueller EN, Tillmann MT, Rosa CS, Guim TN, Vives P, et al. Disease progression of dermatophytic pseudomycetoma in a Persian cat. Rev Iberoam Micol. 2010;27:98–100.
15. Pereira AN, Damico CB, Souza HJM, Corgozinho KB, Graça R, Almeida ECP, et al. Pseudomycetoma dermatofítico causado por *Microsporum canis* em gato da raça Persa. Acta Sci Vet. 2006;34:193–6.
16. Stanley SW, Fischetti AJ, Jensen HE. Imaging diagnosis – sublumbar pseudomycetoma in a Persian cat. Vet Radiol Ultrasound. 2008;49:176–8.
17. Thian A, Woodgyer AJ, Holloway SA. Dysgonic strain of *Microsporum canis* pseudomycetoma in a Domestic Long-hair cat. Aust Vet J. 2008;86:324–8.
18. Tostes RA, Giuffrida R. Pseudomycetoma dermatofítico em felinos. Cienc Rural. 2003;33:363–5.
19. Zafrany A, Ben-Oz J, Segev G, Milgram J, Zemer O, Jensen HE, et al. Successful treatment of an intra-pelvic fungal pseudomycetoma causing constipation and hypercalcemia in a Persian cat. J Feline Med Surg. 2014;16:369–72.
20. Zimmerman K, Feldman B, Robertson J, Herring ES, Manning T. Dermal mass aspirate from a Persian cat. Vet Clin Pathol. 2003;32:213–7.