

Abdominal Maduromycosis in a Dog

Ung-Bok Bak, D.V.M., Ph.D., Chang-Kook Chering, D.V.M., M.S., Ph.D.

and Chang-Hyeong Lim, D.V.M., Ph.D.

College of Veterinary Medicine, Seoul National University

Introduction

Maduromycosis is a rare, noncontagious disease of man and animals characterized by chronic indurative inflammatory swelling termed maduromycotic mycetoma. Historically, mycetoma in man was first reported from India, and most of the early cases were found in the province of Madura.^{2,3,)}

All known animal cases of eumycotic mycetoma with one exception, have occurred in the United States.^{3,9,10)} Three fungi have been incriminated as etiologic agents of maduromycosis in animals, *Helminthosporium speciferum*, *Curvularia (C) geniculata* and *Allescheria (A) boydii*.^{3,4,5,6,7,9,11,12,13)}

Of eleven cases of mycetomas in dogs far reported in United States, two cases of *C. geniculata*, one case of *helminthosporum* species and two cases of *A. boydii* were accepted as identified case studies with available culture findings.^{4,6,7,9,10)} Both cases of *A. boydii* represented abdominal involvement of the lesion.^{9,10)}

In this report a case of eumycotic mycetoma in a dog from France was described with special reference in the pathological findings of the deep mycoses.

Materials and Methods

A three-year-old female Labrador Retriever was referred to the Veterinary College Hospital of Seoul National University on May 8th 1979.

She was spayed on three months old in France and brought to Korea with her owner. The dog revealed persistent digestive disturbances for several months and gained very poor growth of the body. A surgery was performed on May 30th 1979 and died on the fourth day after operation.

The dog was necropsied. The tissue specimens of the lesions were fixed in 10% buffered formalin, prepared into paraffin sections and stained with hematoxylin and eosin or periodic acid Schiff (PAS) reagent for microscopic observation.

Results

Gross findings of pathology

At necropsy a bulky mass about 8 to 15cm in diameter and 2-6cm in thickness was found at visceral surface of ventral end of the spleen (Fig. 1,2,3,) and so one-half of the spleen revealed to be large and fibrous (Fig. 3). Swelled mass of the mycetoma was attached closely by a broad base to visceral surface of the spleen, lower loop of the jejunum, upper loop of the ileum and the ceco-colic junction (Fig. 1).

Parts of the small intestine which were adhered to the mycetoma were strictured, and involved loop of the jejunum and ileum between two strictured portions were distended markedly, while the stomach and the proximal loop of the intestine to the adherent lesion were atrophic (Fig. 1,3,).

Dorsal part of the affected spleen was swelled prominently and displayed many yellowish granular abscesses which were up to 1mm or more in size on cut surface of the lesion (Fig. 4). The mycetoma mass with rough granular surface showed also miliary yellowish granules imbedded within greyish brown granulation tissue. A part of dorsal surface of the mycetoma kept adhesion with the right diaphragm showing thickened and opaque appearance (Fig. 2).

The liver was swelled and to be friable consistency and yellowish brown in color. The peritoneum revealed broad involvement of inflammation with opaque, thick and reddend surface covered by numerous necrotic membranes. The peritoneal cavity contained approximately 600ml of cloudy and greyish brown ascite.

Histopathological findings

The mycetoma lesion was composed of foci of many microabscesses surrounded by dense fibrous tissue. Numerous nonpigmented fungal colonies were found in the centers of foci (Fig. 6). Each colony was surrounded by a variable sized band of neutrophils mixed with many macrophages, smaller numbers of lymphocytes, plasma cells or giant cells, and fibrous tissue at periphery (Fig. 7).

Fungal colonies were spherical, ovoid or scroll shaped (Fig. 6). The outerportion of the colonies were composed of dense interwoven septate hyphae and chlamyospores located at the tips of branching hyphae (Fig. 8). The chlamyospores varied in size and were round or ovoid with thick walls showing PAS staining positive (Fig. 8). Around the fungal colonies, compact fibrous tissue which were studded with many foci of hemosiderin deposition exhibited hyalinization by parts (Fig. 6).

Fungal infection extended to wide area, those tissue such as muscle layer and submucosa of the intestine and the spleen. The affected intestinal wall by adhesion to the mycetoma showed hypertrophy of inner muscle layer to severe extent

(Fig. 5). In the hypertrophic muscle layer of the intestinal wall it was found that isolation of muscle fibers by deposition of numerous hemosiderin and atrophy or hyaline changes of muscle fiber bundle were occurred (Fig. 12). In the affected splenic parenchyma there were proliferation of macrophages, plasma cells, lymphocytes and fibrous tissue, and deposition of hemosiderins (Fig. 11). The fungal colonies which found in the affected splenic parenchyma accompanied poor cellular response showing scarce infiltration of neutrophils and no formation of fibrous tissue around the colonies. The mycetoma mass was not encapsulated by fibrous tissue and so there was close association between affected splenic parenchyma and the mycetoma tissue.

Some of the trabecular arteries of the spleen were occluded by thrombi and the media of the these vesseles were thickened by accumulation of lipid like material to display network of clear round or polyhedral cells presumed to be atheromatous change of the vessels (Fig. 10).

Discussion

The histological characteristics of fungal colonies and tissue changes in this mycetoma case were closely resemble to those in the reports of Kurts et al¹⁰⁾, and Jang and Popp⁹⁾ in which *A. boydii* was identified respectively. Eumycete mycetoma is caused by a variety of fungi that are to be identified by cultural studies in conjunction with the appearance of the fungus in section of tissues. Of the eleven published cases of eumycete mycetoma in dogs only five had a causative agent cultrued and identified. In addition to the cultural examination maduromycosis caused by *A. boydii* is identifiable by the appearance of the grain in histopathological sections in the absence of cultural studies.²⁾ From the characteristic septate hyphae and peripheral chlamyospores of the colony the causative fungus of the mycetoma of the dog might be identified as *A. boydii*.

Two cases of *A. boydii* far reported were involved with abdominal lesions both. The mycetoma lesion this case was more severe than those of the former two cases in the reflexion upon size of mycetoma mass and extension of fungal infection through the abdominal organs.

The characteristic changes of histopathology in this case were summarized as extensive adhesion between the mycetoma and the visceral organs, marked compensatory hypertrophy of the muscle layer of the intestinal wall which was adherent to the mycetoma, widespread hemosiderin deposition through the affected organs, and thrombosis of the splenic arterioles with the atheromatous change. It might be attributed these chronic changes of the lesion to persistent circulatory disturbances due to massive growing of the mycetoma and the fungus toxin. And it was suggested that the chronic lesion provoked persistent functional failure of the digestive tracts to attain body weight of the dog as half as a normal dog.

Because so few cases of maduromycosis have been reported in animals, the knowledge concerning the anatomic predilections on the pathogenesis of infection was obscure. *A. boydii* has been found to be a saprophyte in soil and sewage.^{1,8)} In general, maduromycotic mycetoma tends to occur on parts of the body surface prone to traumatic injury. Of the two cases of infection by *A. boydii*

reported in the dogs, both involved fistulous tracts penetrating to abdominal cavity, and one of these was thought to be due to contamination following a surgical procedure.

In our report the dehiscence of the surgical site following ovariectomy would have provided an entrance to the bacteria into the abdominal cavity. The histologic lesion of the intestinal wall showing severe involvement of the serosal and muscular layers and scant involvement of the mucosa might indicate that the gastro-intestinal tract could be improbable as a route of bacterial infection.

Summary

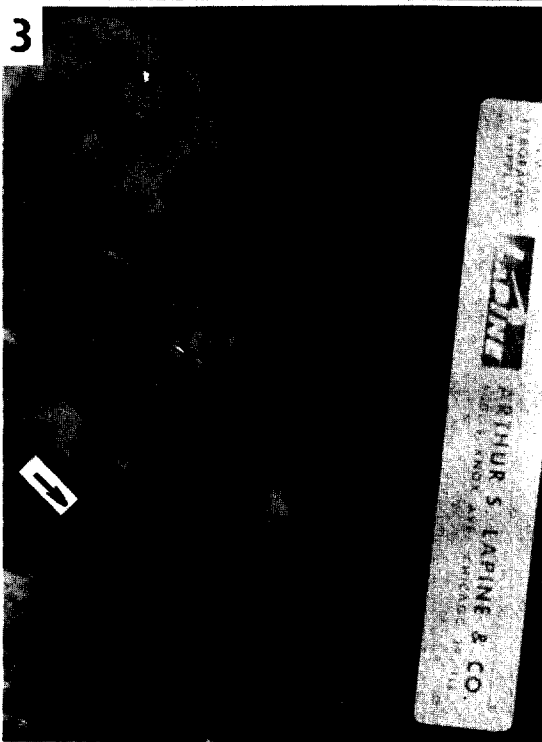
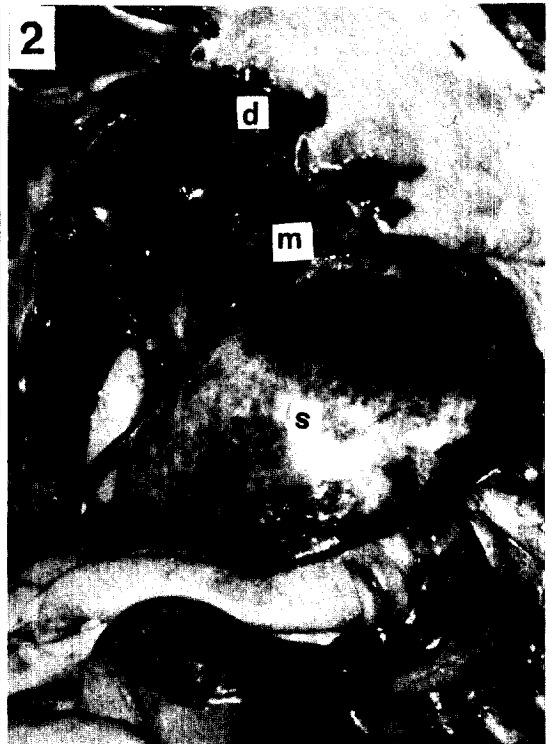
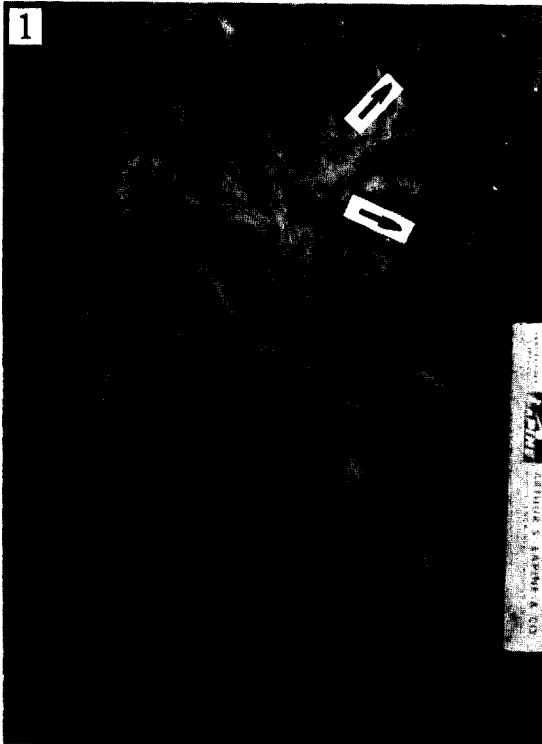
A massive mycetoma was observed in the abdominal cavity of a 3-year-old spayed female Labrador Retriever dog originated from France. The mycetoma lesion involved adhesion with one-half of the spleen, several portions of the small and large intestine, and the diaphragm. Histologically the distinct hypertrophy of the intestinal muscle layer, wide-spread deposition of the hemosiderin through the affected abdominal organs and thrombosis of splenic arterioles with atheromatous change were recognized as persistent, debilitating changes of the affected organs. From the histological appearance of the fungal colonies it was presumed that the causative fungus to be identified as *Allescheria boydii*.

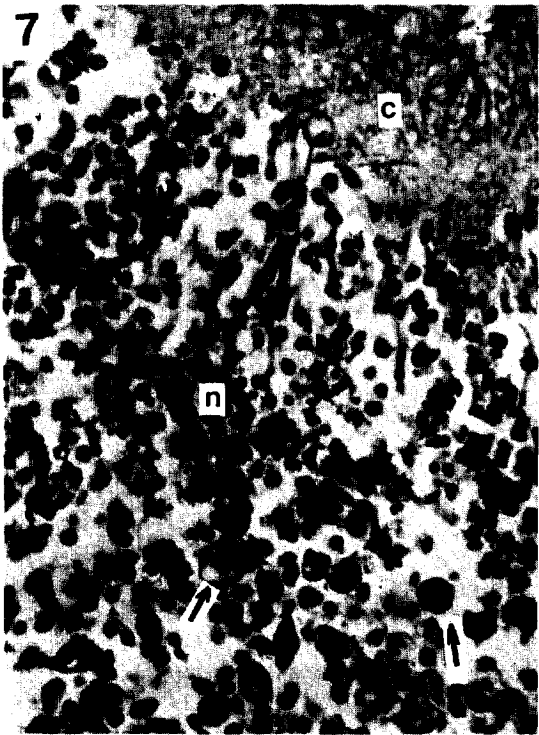
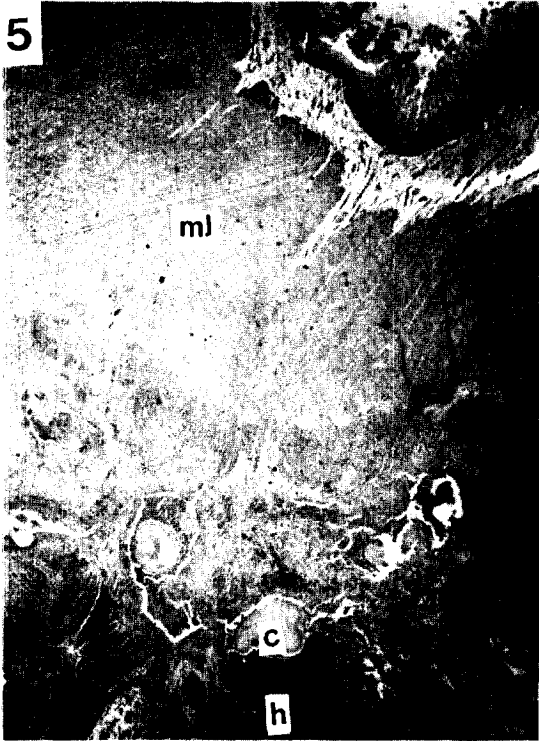
Legends for Figures

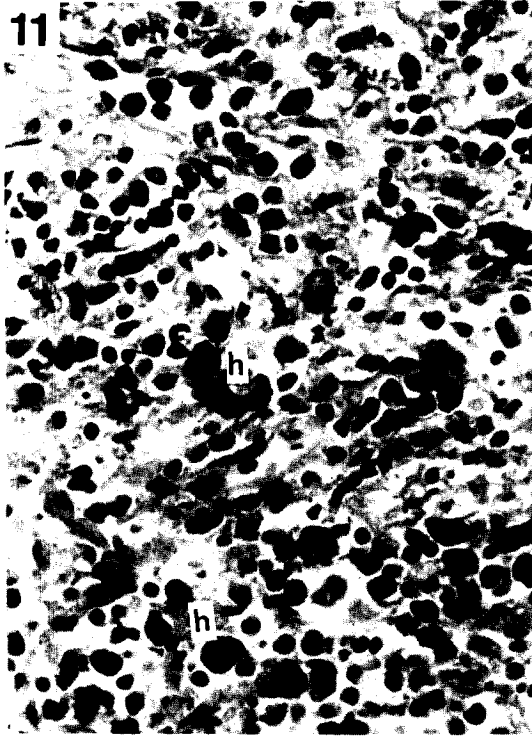
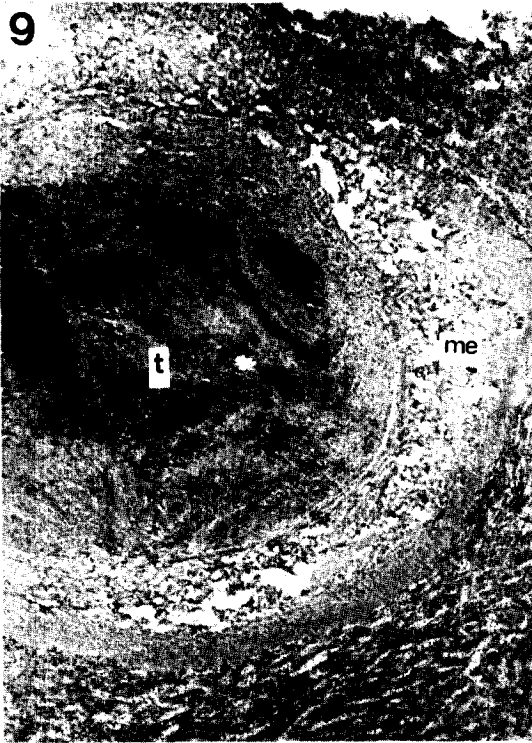
- Fig. 1.** The massive mycetoma (m) involved in the abdominal organs showing adhesion with the spleen (s) and the small intestine, and hypertrophic intestinal wall (arrows).
- Fig. 2.** The mycetoma mass (m) attached to the visceral surface of the spleen (s) and the left side of the diaphragm (d).
- Fig. 3.** The mycetoma lesion (m) showing adhesion with the visceral region of the spleen and the loop of the jejunum. The affected half of the spleen (s) is much swelled dorsally. The intestinal loop with is adherent to the mycetoma was strictured (arrow), while the proximal loop from the structured portion shows the hypertrophic feature (i).
- Fig. 4.** The cut surface of the mycetoma mass showing yellowish abscess granules disseminated in the greyish brown fibrous tissue.

Microscopic findings of the lesions

- Fig. 5.** The close involvement of the mycetoma with the wall of the small intestine showing extensive hypertrophy of the inner circular muscle layer (ml), the fungal colonies (c) and hemosiderin (h) deposition in the mycetoma tissue. Hematoxylin and eosin (HE) stain, X3.25
- Fig. 6.** A group of the fungal colonies (c) surrounded by bands of neutrophils (n) and dense fibrous tissue (f). HE stain, X10.
- Fig. 7.** The cellular response to the fungal microorganism (c) showing pool of neutrophils (n) mixed with macrophages (arrows). HE stain, X100.
- Fig. 8.** A fungal colony showing interwoven septate hyphae (hy) and chlamydospores at periphery of the colony (arrows). PAS stain, X100.
- Fig. 9.** The splenic arteriole occluded by thrombus (c) showing thickening of the media (me). HE stain, X10.
- Fig. 10.** Higher magnification of the media of the arteriole in Fig. 9 showing network of the distended round or polyhedral, clear cells with accumulation of lipids like material (arrows). HE stain, X33.
- Fig. 11.** The red pulp of the affected spleen showing proliferation of macrophages, plasma cells and lymphocyte, and deposition of hemosiderin (h). HE stain, X132.
- Fig. 12.** Muscle layer of the affected intestinal wall showing isolation of muscle fibers due to infiltration of siderocytes (h). HE stain, X100.







References

1. Ajello, L.: The isolation of *Allescheria boydii* Shear, an etiologic agent of mycetomas from soil. Am. J. Trop. Med. & Hyg. (1952) 1:227.
2. Anderson, W.A.D. and Kissane, J.M.: Pathology 7th ed., Saint Louis, (1977), C.V. Mosby Co. p. 509.
3. Benirschke, K., Garner, F.M. and Jones T.C.: Pathology of laboratory animals, Vol. II, New York, Berlin, (1978) Spring Verlag, p.1569.
4. Bridges, C.H.: Maduromycotic mycetomas in animals, *Curvularia geniculata* as etiologic agent. Am. J. Path., (1957) 33, 411.
5. Bridges, C.H.: Madromyosis of bovine nasal mucosa (Nasal granuloma of cattle). Cornell Vet. (1960) 50:469.
6. Bridges, C.H., and Beasley, J.N.: Maduromycotic mycetomas in animals-*Brachycladium spiciferum* Bainer as the etiologic agent. J. Amer. Vet. Med. Ass. (1960) 137:192.
7. Brodey, R.S., Schryver, H.F., Deubler, M.J., Kaplan, W. and Ajello, L.: Mycetoma in a dog. J. Amer. Vet. Med. Ass. (1967) 151: 442.
8. Cooke, W.B. and Kabler, P.: Isolation of potentially pathogenic fungi from polluted water and sewage. Pub. Health Rep., (1955) 70:689.
9. Jang, S.S. and Popp, J.A.: Eumycotic mycetoma in a dog caused by *Allescheria boydii*. J. Amer. Vet. Med. Assv. (1970) 157:1071.
10. Kurtz, H.J., Finco, D.R. and Perman, V.: Maduromycosis (*Allescheria boydii*) in a dog. J. Amer. Vet. Med. Ass. (1970) 157: 917.
11. Pezenburg, E.: *Allescheria boydii* shear 1921 isoliert aus einer Hautveränderung beim Hund. Mykosen. (1958) 1:172.
12. Roberts, E.D, McDaniel, H.A. and Carbey, E.A.: Maduromycosis of the bovine nasal mucosa. J. Amer. Vet. Med. Ass. (1963) 142:42.
13. Seibold, H.R.: Mycetoma in a dog. J. Amer. Vet. Med. Ass. (1955) 127:445.

개의 腹腔 Maduromycosis

朴 應 鎭 · 鄭 昌 國 · 林 昌 亨

서울대학교 獸醫科大學

抄 錄

慢性 消化器障導로 手術을 받고 폐사한 3 세의 개를 剖檢하여 腹腔에서 커다란 菌腫을 발견하였다. 이 개의 品種은 Labrador Retriever 種이고 프랑스에서 卵巢摘出 手術을 하여 韓國에 데려왔다. 菌腫은 直徑 8~15 cm, 두께 2~6 cm에 달하는 腫瘤로서 脾尾部의 腹面, 空腸, 廻腸, 盲-結腸의 일부 腸壁 및 좌측 橫隔膜과 단단한 癒着을 일으키고 있었다. 菌腫의 斷面에서는 灰褐色의 肉芽組織에 粟粒大의 黃白色 膿瘍顆粒이 密發해 있는 것을 알 수 있었다. 病巢部位의 組織學的 檢査에서 腸壁의 內輸走筋層의 극심한 代償性肥大, 菌腔과 관련된 腹腔臟器에서의 광범한 hemosiderin 沈着 및 脾柱動脈의 血栓症과 그 中膜의 atheroma 性 肥厚등을 관찰하였다. 이와 같은 慢性 病變으로 인하여 이 개는 정상개의 반 밖에 자라지 않고 있었다. 菌腫내의 菌塊를 현미경 관찰하여 菌絲와 厚膜胞子の 특징으로써 *Allescheria boydii* 의 感染이 추정되었다.