Candidiasis is an opportunistic infection and principally manifests as a superficial mycosis of mucous membranes, such as oral mucosa and skin [3]. Cutaneous candidiasis has been reported in dogs, cats, pigs, and horses [3]. Systemic candidiasis is less common and a few case reports have been reported in humans, calves, swine, dogs, and mice [1, 2, 4, 5]. In this paper, we describe the gross and histopathologic findings of systemic candidiasis with severe spondylitis in a dog.

A 4-year-old male Shiba dog was presented to a private animal hospital. According to the owner, the dog had uncertain pain and was hypersensitive to touch. Upon physical examination, the dog had a fever (40°C), slight leukocytosis (18,000/µl) and hypertrophy of the prostate gland. The animal was treated with antibiotics (mixture of trimethoprim and sulfadimethoxine, 30 mg/kg, bid) and analgesic (aspirin, 10 mg/kg, bid). Seven days after the initial presentation, the dog developed ataxia, especially in the hindlimbs, and knuckling of both hind-legs. Thoracic radiography revealed a mass located in dorsal part of thoracic vertebra T3 and T4 (Fig. 1). The dog died 20 days after presentation, and a complete necropsy was conducted.

On postmortem examination, a gray-white mass (3.5 × 4.0 × 2.0 cm) in the thoracic vertebra T3 compressed thoracic spinal cord (Fig. 2). The mediastinal lymph node was markedly swollen (6.0 × 4.5 × 4.2 cm) and located just beneath the thoracic mass. Additional lymph nodes (axillary, superficial cervical, mediastinal, pancreatic, mesenteric, lumbar aortic) were also swollen with scattered, variously sized white spots on the cut surface. Small sized white spots were also seen in the kidneys, pancreas, spleen, prostate gland, thyroid glands, and heart.

Histopathologically, the mass in the thoracic vertebra consisted of granulomatous inflammation with many macrophages, epithelioid cells, and giant cells. Inflammatory infiltrates involved the body of vertebra and granulomatous lesions were observed in the bone marrow of vertebra (Fig. 3). There was extensive necrosis in the lesions accompanied by a small number of infiltrating lymphocytes and plasma cells. Numerous fungal organisms were seen throughout the lesions. The fungal pseudohyphae lightly stained with H&E and ovoid chlamydospores strongly stained with periodic acidic Schiff reaction. By Grocott stain, sausage-like, twisted, approximately 3 µm in width of pseudohyphae were observed (Fig. 4). The cytoplasm of foreign body giant cells often contained fungal bodies. After using an antibody against Candida albicans (kindly provided by Dr. M. Kubo, National Institute of Animal Health, Japan) on paraffin embedded tissue sections with avidin-biotin-peroxidase kit (Dako), both fungal pseudohyphae and chlamydospores were strongly positive (Fig. 5). Antibody against Aspergillus fumigatus did not react positively to the fungi. Granulomatous inflammation and fungal organisms were also found in lymphatics and veins around the mass. The thoracic spinal cord was compressed by the mass and degeneration of the white matter and swollen axons were often observed. Similar granulomatous lesions containing numerous fungi were found in the visceral organs and systemic lymph nodes, where the scattered white spots were distributed on the necropsy.

A diagnosis of systemic candidiasis with spondylitis was made based on histopathological and immunohistochemical findings. In veterinary medicine, a limited number of cases of systemic candidiasis have been reported [1, 2, 4, 5]. The lesions developed in the bowel, lungs, kidneys, brain and skin. Osteomyelitis involving the right humerus has been described in one case of canine systemic candidiasis [5]. Clinical signs of hind-limb ataxia found in the present case were considered to be associated with compression of spinal cord by expansion of thoracic lesion. Candidiasis is principally a superficial mycosis of mucous membrane. No pathologic lesion was found in the skin and mucous membrane, including mouth, tongue and esophagus in the present case. Therefore the initial site in the present case remains uncertain. The distribution of lesions and presence of many
fungi in the blood vessels and lymphatics suggested that the infection spread systematically via these routes.

Many of pathogenic fungi are opportunistic and non-pathogenic under normal conditions. Systemic candidiasis is often associated with immunosuppression, poor physical condition, or iatrogenic manipulations [3]. Parvovirus and feline panleukopenia virus infections cause immunosuppression and secondary systemic candidiasis [6, 7]. Exces-

Fig. 1. Lateral radiograph of thoracic region, with a mass (arrows) on T3.

Fig. 2. Cut surface of vertebra (T3); Shiba dog, a mass is found in the body of vertebra compressing the spinal cord.

Fig. 3. Vertebra (T3); Shiba dog, Low power view of candidial spondylitis. Granulomatous inflammation involving the body of vertebra (*). HE Bar=1 mm.

Fig. 4. Vertebra (T3); Shiba dog, several oval yeast-like, long filamentous pseudohyphae in the lesions. Grocott silver impregnation stain. Bar=15 µm.

Fig. 5. Vertebra (T3); Shiba dog, Many fungi stain positively for Candida albicans. Immunohistochemistry for Candida albicans counterstained with hematoxylin. Bar=15 µm.
sive antibiotic administration is also an important iatrogenic condition that can predispose to systemic candidiasis. The precise pathogenesis of the systemic candidiasis in this case remains unclear.

REFERENCES