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Splenic Mast Cell Tumors in Two Cats

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Abstract : Two 11-year-old cats, female Korean shorthair cat and male Siamese cat, with abdominal distention were presented to the local animal hospitals. Radiographic and ultrasonographic examinations revealed moderate to severe splenomegaly in both cats. In Korean shorthair cat, multiple masses were also existed on the anal and facial skin. Surgically excised whole spleens of two cats were requested for histopathologic examination. Histopathologically, numerous neoplastic round cells with cytoplasmic fine granules were widely infiltrated in the splenic parenchyma. The cytoplasmic granules were metachromatic on toluidine blue staining. These splenic masses were diagnosed as splenic mast cell tumors. Among them, Korean shorthair cat was remained healthy for at least 1 year after splenectomy. Because of no visiting of owner, we were only able to know the information for Siamese cat until 10 months after the splenectomy. To our best knowledge, this is the first detail case reports for splenic mast cell tumors in cats in Korea.

Key words **:** cat, histopathology, mast cell tumor, spleen, splenectomy.

Introduction

Mast cell tumors (MCTs) are the third most common type of neoplasia in cats, after lymphoid malignancies and mammary tumors (1). MCTs in cats are generally classified into three categories based on the involved organ: cutaneous and visceral such as splenic and intestinal MCTs, although multiple organ systems may also be involved simultaneously. Splenic MCT is one of the most common splenic tumors in cats, representing 15-26% of all splenic neoplasia (4,13). Cutaneous lesions are typically benign, but splenic and intestinal lesions are often associated with a poor prognosis because of the increased invasiveness and frequency of local and distant metastasis associated with these tumor types (1). Cats with the visceral MCTs may have signs of systemic illness including lethargy, anorexia, weight loss, and intermittent vomiting (1,2).

Splenectomy has been advocated as the primary therapy for splenic MCTs, with previously published individual survival times ranging from 8 to 38 months (7,14). The efficacy of adjuvant chemotherapy and steroids is still largely unknown.

Although splenic MCTs were common in feline populations of other countries, there was no case report and available data for this tumor in Korea. This report describes the histopathologic and immunohistochemical features in two cases of splenic MCTs in cats in Korea.

Cases

An 11-year-old neutered female Korean shorthair cat (case 1) was presented to a local animal hospital with various small masses on the anal and facial skin and with abdominal distention. The initial purpose of the visit was related to the cutaneous symptoms. Hematological analysis revealed thrombocytopenia (102 K/μL, reference range 150-500 K/μL). Biochemical analysis showed normal results. Fine needle aspiration (FNA) tests were performed to the skin mass around anus and spleen.

An 11-year-old neutered male Siamese cat (case 2) was presented to other local animal hospital with anorexia, sporadic vomiting, and abdominal distention. Hematological analysis revealed polycythemia (14 M/μL, reference range 5-11 M/μL). Biochemical profiling indicated an increase in liver enzyme (ALT 306 U/L, reference range 12-118 U/L).

On radiographic and ultrasonographic examinations, sple-

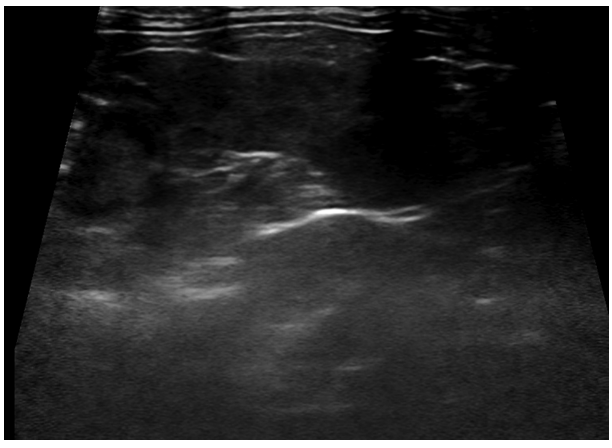

Fig 1. Ultrasonographic findings for Siamese cat. Enlargement and heterogenous echogenicity of the spleen.

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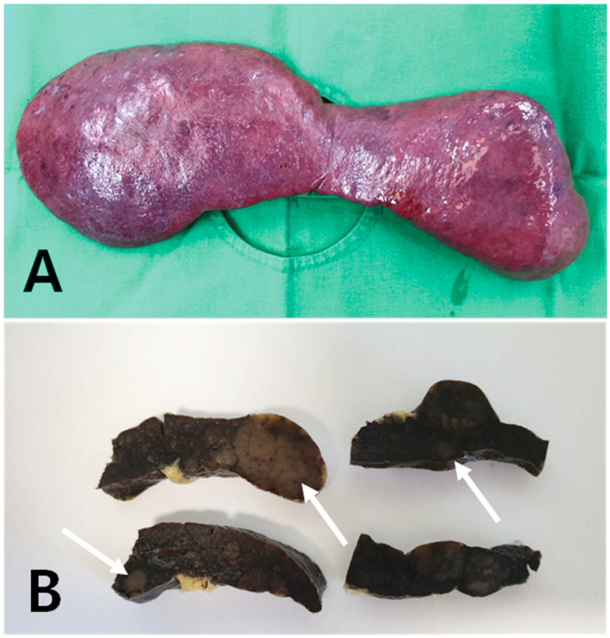

Fig 2. Gross findings. (A) Korean shorthair cat. Note the markedly enlarged spleen with round edges. (B) Siamese cat. Multiple pale to tan colored abnormal round nodular masses (arrows) were observed in the formalin-fixed splenic parenchyma.

nomegaly was observed in both cats (Fig 1). Because the splenic neoplasia was suspected in these cases, the entire spleens of two cats were surgically excised. Grossly, the excised spleens showed severe swelling with round peripheral edges, especially in Korean shorthair cat (Fig 2A). The spleen was firm and dark red to gray color. In Siamese cat, multiple pale to tan colored abnormal round nodular masses were observed in the splenic parenchyma (Fig 2B). According to Wright-Giemsa staining for FNA slides from the anal skin and the spleen, characteristic monomorphic population of round cells with abundant cytoplasmic metachromatic granules that were consistent with mast cells were clearly demonstrated. Surgically excised spleen samples were immediately fixed in 10% neutral buffered formalin and submitted to the Veterinary Pathology Laboratory in Jeju National University for routine pathologic examination. The samples were processed and stained with hematoxylin and eosin (H&E), and toluidine blue stain for light microscopy examination. To assess KIT expression, immunohistochemistry (IHC) for CD117 (rabbit polyclonal antibody, 1:500, Dako, Denmark) was also performed.

Histopathologic examination revealed diffusely distributed numerous round tumor cells throughout the splenic parenchyma in case 1. These tumor cells were round to polyhedral in shape with a finely granulated cytoplasm (Fig 3A). Nuclei were large, round, vesicular, and hyperchromatic with marginated chromatin, and had prominent nucleoli. The mitotic count was very low. On the other hand, multifocal nodular masses were observed in the spleen of case 2. Numerous round cells were widely distributed in the nodular masses and occasionally in the normal splenic red pulp. The morphology of the tumor cells was similar to that of case 1. Toluidine blue stain demonstrated metachromatic cytoplasmic

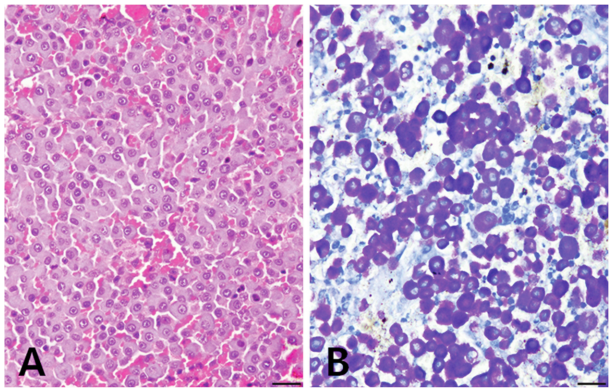

Fig 3. Histopathologic findings. (A) Neoplastic cells were round to polyhedral in shape with finely granulated cytoplasm in Korean shorthair cat (H&E, Bar = 20 μm). (B) The cytoplasmic granules of tumor cells were metachromatic in Siamese cat (Toluidine blue, Bar = 20 μm).

granules of tumor cells in both cats (Fig 3B). However, the neoplastic mast cells in the spleen of two cats were all negative for IHC staining using CD117 antibody.

Based on the clinical and gross findings, histopathologic examination, and IHC results, two cats were diagnosed with splenic MCTs.

The cats did not receive any specific treatment for splenic tumors except splenectomy. Korean shorthair cat (case 1) was alive and healthy for 1 year after surgery. Because of no visiting of owner, we were only able to know the information for Siamese cat (case 2) until 10 months after the splenectomy.

Discussion

Splenic MCT is predominantly a disease of older cats with no breed or sex predilection. Although the sample size was very low in this study, the age of both cats was 11 years. This is very similar with previously reported data on the onset age of MCTs (3,6). In agreement with previous studies (3,6), male Siamese cat was presented with nonspecific gastrointestinal signs such as anorexia and sporadic vomiting. In contrast, female Korean shorthair cat had two concurrent MCTs in spleen and anal skin. Simultaneous occurrences of cutaneous tumors have been identified in 3-23% of cats with splenic MCT (8,12) This phenomenon is not well understood until today, and there is no way to distinguish between a primary splenic MCT and a secondary metastatic splenic MCT originated from the primary skin tumor. The male Siamese cat did not show any involvement in regional lymph nodes, liver, and intestine.

Splenomegaly is the most common clinical feature in cats with visceral MCTs under the physical examination and diagnostic imaging methods. However, various other splenic conditions can also be present with moderate to severe splenomegaly. The feline spleen with MCT may appear mottled, nodular or irregular, and enlarged. According to the previous large scaled study of sonographic findings in 101 cats (4), 25 (83%) of 30 cats with lymphosarcoma and 25 (93%) of 27 cats with MCT had splenomegaly, respectively. Even 11

(41%) of 27 cats with extramedullary hematopoiesis and/or lymphoid hyperplasia also had splenomegaly. Hence, there are no imaging methods to distinguish the characteristic findings of feline splenic MCT from other spleen diseases (4). Therefore, the differential diagnosis of splenic tumors can be made by the cytological evaluation of FNA or the histopathologic examination for biopsy sample of the mass. For splenic tumors, the ultrasonographic appearance of the affected organ can be useful for guiding FNA target site for cytology (4). In this study, both cats showed splenomegaly with variable degree. Splenic MCTs were easily diagnosed in both cats by histopathologic examination from the surgically excised spleens.

C-kit proto-oncogene product (KIT, CD117) is a receptor tyrosine kinase for stem cell factor produced by a number of cells including mast cells (11). Tyrosine kinases are cell membrane-bound growth factor receptors that, when mutated, can result in uncontrolled cellular proliferation (5). In canine cutaneous MCTs, c-kit mutation or KIT protein overexpression is a significant prognostic marker for MCTs or systemic mastocytosis and are considered good targets for treatment with kinase inhibitors (11,15). However, the correlation between KIT expression and tumor proliferative activity or disease outcome has been found to be very low in feline MCTs, especially cutaneous MCTs (11). In addition, the KIT expression in feline splenic MCTs was lower than that of cutaneous MCTs (9). No c-kit mutations were identified in feline splenic MCT specimens in a previous study (2). This result indicated that receptor tyrosine kinase inhibitor therapy for splenic MCTs may not be benefit for the treatment in cats. In accordance with previous reports, no KIT protein was detected in two feline spleen samples of present study.

Treatment methods for feline MCTs include histamine blockade, surgery including splenectomy, chemotherapy, and receptor tyrosine kinase inhibition (5). Among them, several studies indicated that surgery was the best choice of treatment due to relatively long survival times for splenectomy alone (7,13). In a more recent study, two cat groups with splenic MCTs that underwent splenectomy with/without chemotherapy had prolonged survival times than cats in other group received chemotherapy alone (3). Regardless, splenectomy of cats with splenic MCTs has been associated with median survival times of 12-19 months (range: 0-64 months) (6,7,10,12). In this study, splenectomy without additional chemotherapy was performed in both cats at the time of confirming splenomegaly using sonographic examination. After the surgery, the female Korean shorthair cat and the male Siamese cat were still alive and healthy for 1 year and 10 months, respectively.

Conclusion

Because of the small sample size in this study, we could not find any significant prognostic factors for the survival of cats. However, we believe that the result of our study would be helpful to make an accurate diagnosis for radiographic and histopathological examinations of feline splenic MCTs.

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Conflict of Interest

No conflicts of interest have been declared.

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