NOTE *Pathology*

Splenic angiomyxoma with intravascular tumor embolus in a dog: a case report

Eun-Mi LEE[1,2], Ah-Young KIM[1,2], Eun-Joo LEE[1,2], Jin-Kyu PARK[1], Tae-Hwan KIM[1], Se-Il PARK[3] and Kyu-Shik JEONG[1,2]*

[1]*Department of Pathology, College of Veterinary Medicine, Kyungpook National University, Daegu, 41566, Republic of Korea*
[2]*Stem Cell Therapeutic Research Institute, Kyungpook National University, Daegu, 41566, Republic of Korea*
[3]*Cardiovascular product evaluation center, College of Medicine, Yonsei University, Seoul, 03722, Republic of Korea*

(Received 21 December 2015/Accepted 29 February 2016/Published online in J-STAGE 13 March 2016)

ABSTRACT. A 13-year-old castrated male Yorkshire terrier dog had a soft splenic mass, which measured 11 cm in the greatest diameter. Microscopically, the parenchyma of the spleen was completely replaced by myxoid substances. Numerous spindle and stellate cells were loosely arranged in the myxoid stroma, and variable vessels of variable sizes were observed in a loose matrix with poorly defined margins. Immunohistochemical analysis showed that tumor cells were positive for desmin and alpha-SMA, but negative for S-100. Interestingly, intravascular tumor embolus with positive α-SMA expression was observed. This case is meaningful, because angiomyxoma, a rare tumor of dogs, occurs in the spleen. Even in human cases, splenic angiomyxoma was not reported.
KEY WORDS: dog, histopathologic diagnosis, intravascular tumor embolus, splenic angiomyxoma

doi: 10.1292/jvms.15-0715; *J. Vet. Med. Sci.* 78(6): 1085–1088, 2016

Angiomyxoma is a rare type of myxoid neoplasm involving the blood vessels in humans. They arise most often in the head and neck regions, on the trunk, or in the vulvovaginal region [1, 4]. In veterinary medicine, they are extremely rare. Therefore, there are only two reports regarding angiomyxoma. One peritoneal angiomyxoma case was reported in a 2 year-old Flemish cow [6]. In addition, another angiomyxoma was reported in the kidney of an 11-year-old crossbred Collie dog [5]. There have been no reports of splenic angiomyxoma in veterinary, as well as human medicine. We report the first case of splenic angiomyxoma.

A 13-year-old castrated male Yorkshire terrier dog was admitted to a local animal hospital with decreased appetite, weakness and mild abdominal distension. Abdominal ultrasonography demonstrated a large well-marginated and heterogeneous echotexture. Other portions of the mass were shown ultrasonographically as an overt cyst (Fig. 1).

During surgery, a splenic tumor mass was removed from the dog. The sample was fixed with 10% neutral buffered formalin, and routinely processed and embedded in a paraffin block. Sections of 4 μm thickness were obtained from the paraffin block and stained with hematoxylin and eosin (H&E) for light microscopic analysis, and alcian blue for detection of myxoid materials. To identify the origin of the neoplastic cells, sections were stained immunohistochemically using the avidin-biotin-peroxidase complex (ABC) (Vectastain ABC kit, Vector Laboratories, Burlingame, CA, U.S.A.). Neoplastic tumor sections were stained with anti-α-smooth muscle actin (α-SMA) (Sigma-Aldrich, St. Louis, MO, U.S.A.), anti- desmin (Dako, Glostrup, Denmark) and anti- S-100 (Santa Cruz Biotechnology, Inc., Dallas, TX, U.S.A.) primary antibodies.

Macroscopically, the protruding splenic mass was large and soft. It measured 11 cm at its greatest diameter (Fig. 2A and 2B). It was partly gelatinous and glistening when observed in cross-section. It also exhibited color heterogeneity ranging from whitish to brownish (Fig. 2C and 2D). It appeared to be tinged with blood from hemorrhage and necrotic foci.

Microscopically, the parenchyma of the spleen was completely replaced by myxoid stroma. There were many vessels of variable sizes scattered throughout the tumor parenchyma (Fig. 3A). The cells were a combination of spindle-shaped and stellate cells, were loosely arranged in myxoid stroma and exhibited low cellularity (Fig. 3B). Myxoid stromal materials were stained blue in the alcian blue staining (Fig. 3C). Microcystic changes were found in some regions (Fig. 3D). Hemorrhage, necrosis and infiltration of numerous inflammatory cells including neutrophils were observed (Fig. 3E and 3F). Occasionally, clusters of lymphocytes assumed to be the rudiments of the white pulp of normal spleen tissue were seen (Fig. 3G). Immunohistochemically, the tumor cells tested positive for α-SMA (Fig. 4A) and desmin (Fig. 4B), and negative for S-100 (Fig. 4C). Additionally, to examine further immunohistochemical characteristics of tumor cells, immunostaining for vimentin was performed. Unfortunately, we didn't obtain positive results for vimentin (data not shown). The mitotic figures were scarce. However, interestingly, intravascular tumor embolus expressing α-SMA was observed, assumed to be evidence of metastasis (Fig. 4D).

Angiomyxoma is a rare type of mesenchymal tumor in humans. Superficial and aggressive angiomyxomas are the two types of angiomyxoma. Superficial variant occurs more

*CORRESPONDENCE TO: JEONG, K.-S., Department of Pathology, College of Veterinary Medicine, Kyungpook National University, 80 Daehakro, Bukgu, Daegu, 41566, Republic of Korea.
e-mail: jeongks@knu.ac.kr

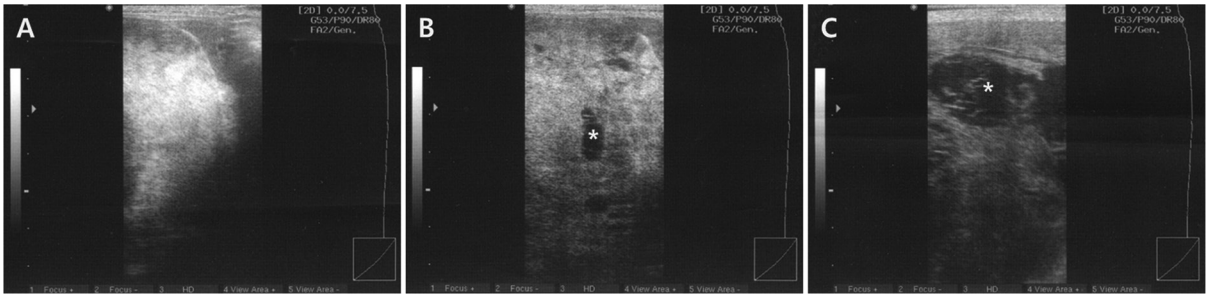

Fig. 1. The sonogram of a splenic mass. (A–C) The mass is large and well-marginated with heterogeneous echotexture. Other portions of mass were shown ultrasonographically as an overt cyst (stars).

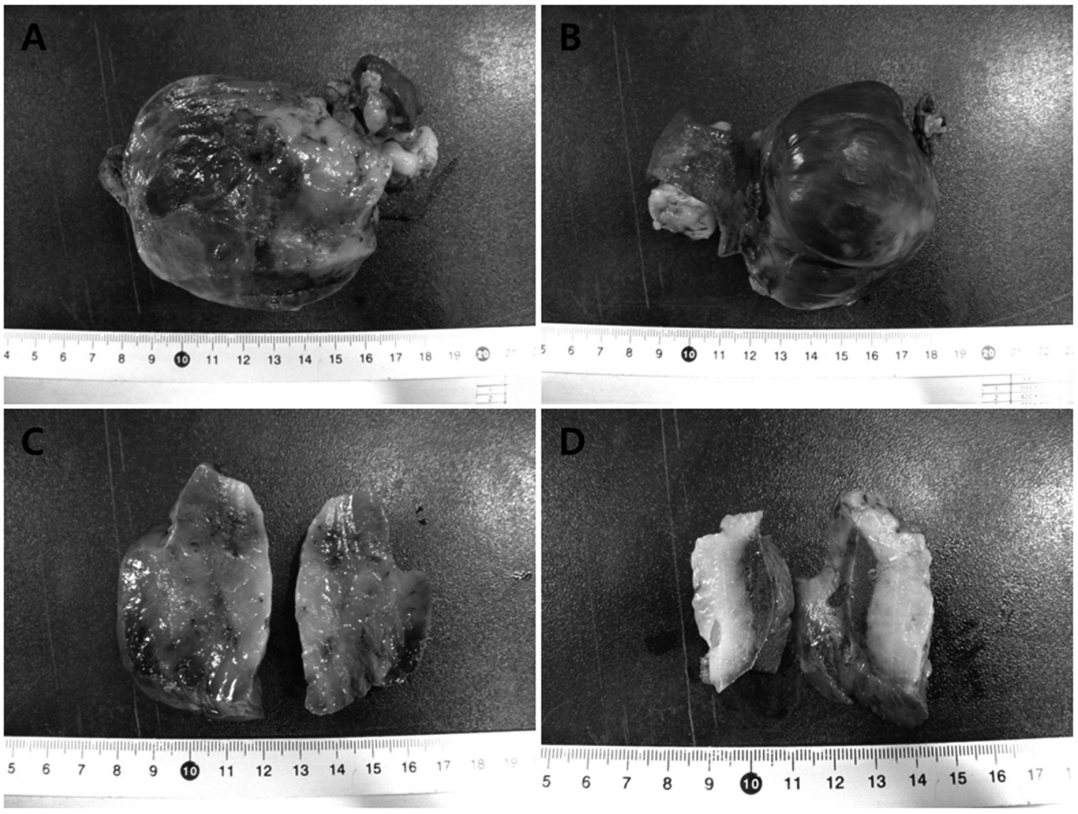

Fig. 2. Gross findings of a mass. (A, B) The large, soft mass protruded from the spleen and measured 11 cm at its greatest diameter. (C, D) Cross-section of the mass was gelatinous and glistening. It exhibited color heterogeneity ranging from whitish to brownish.

frequently in the head and neck regions, on the trunk, or in the vulvovaginal region as superficial, slow growing nodules. Therefore, this type is more likely to grow on the outer surfaces of lesions [4]. Aggressive angiomyxoma arises more frequently in the vulva or pelvis of adult females. These neoplasms form large gelatinous masses and infiltrate the soft tissues of the pelvis and perineum. Aggressive angiomyxoma is characterized by small vessels in an abundant myxoid stroma and is constituted of scattered spindle and stellate shaped cells. Immunohistochemically, the spindle cells may be positive for actin, desmin and vimentin, but do not stain for S-100 protein, factor VIII-related antigen, carcinoembryonic antigen (CEA) and cytokeratin [1, 5]. In this case, the tumor cells were immunohistochemically positive for α-SMA and desmin and negative for vimentin and S-100, showed immunohistochemical characteristics of angiomyxoma, except for vimentin. It seems to be caused by formalin antigen inactivation due to long storage in formalin. Immunostaining for α-SMA, desmin and S-100 was previously performed, but immunostaining for vimentin was

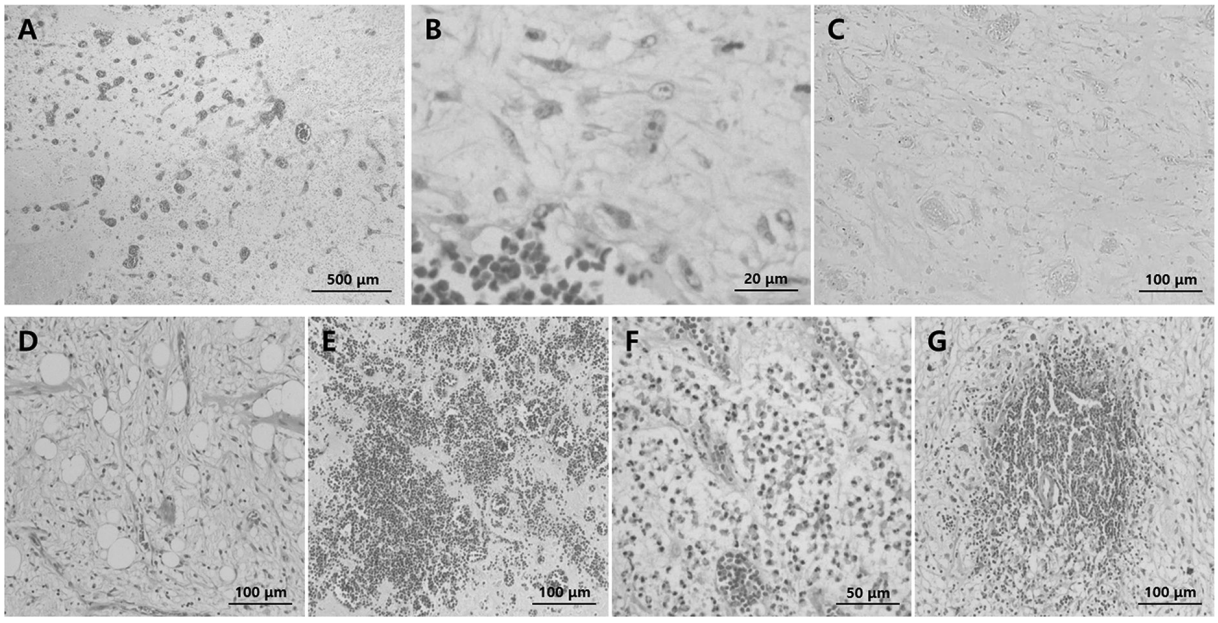

Fig. 3. Histopathological findings of the splenic mass. (A) Blood vessels of variable sizes were observed, and cellularity was very low (H&E, 50×, Bar=500 μm). (B) Neoplastic spindle cells and stellate cells were embedded in loose myxoid materials (H&E, 1,000×, Bar=20 μm). (C) Using Alcian blue staining, myxoid materials were stained blue (Alcian blue, 200×, Bar=100 μm). (D) Microcystic change (H&E, 200×, Bar=100 μm), (E) Hemorrhagic area (H&E, 200×, Bar=100 μm), (F) Necrosis and infiltration of numerous inflammatory cells including neutrophils (H&E, 400×, Bar=50 μm) and (G) Cluster of lymphocytes (H&E, 200×, Bar=100 μm) were observed.

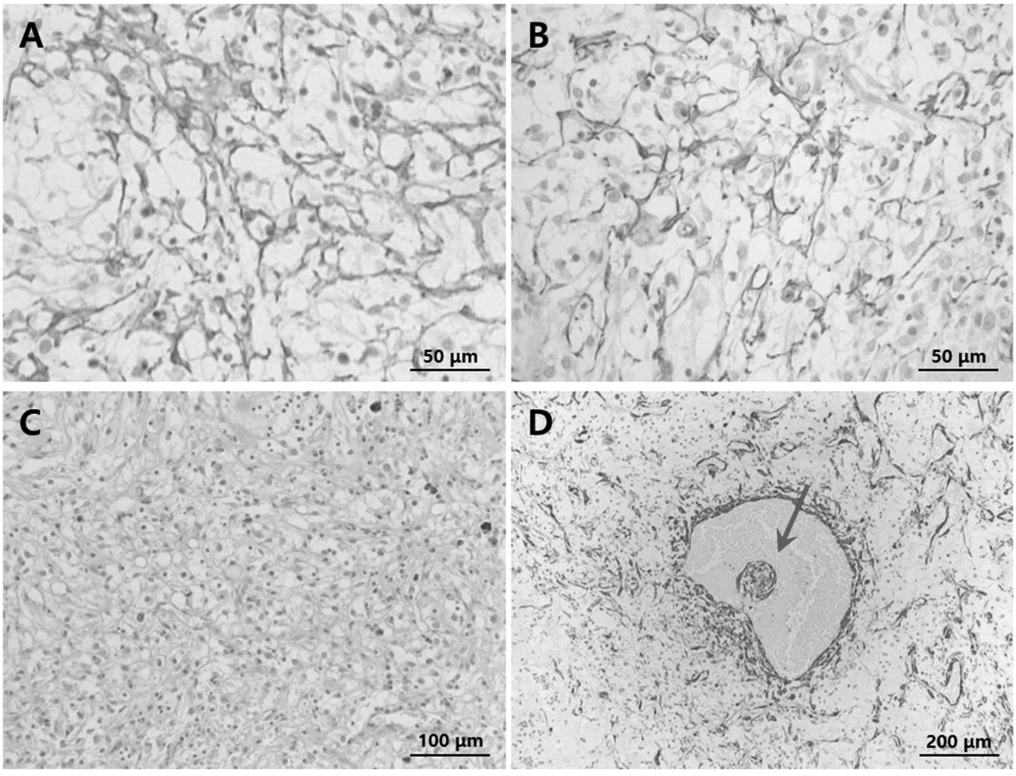

Fig. 4. IHC staining of tumor cells. (A) Neoplastic cells were strongly positive for α-SMA (400×, Bar=50 μm). (B) Tumor cells also showed desmin expression (400×, Bar=50 μm). (C) These cells were negative for S-100 (200×, Bar=100 μm). (D) In the section IHC stained for α-SMA, intravascular tumor embolus (arrow) with positive α-SMA expression was observed (100×, Bar=200 μm).

performed later. On ultrasonography, the angiomyxoma has generally been described as a hypoechoic and cystic mass. However, in some cases, an angiomyxoma ultrasonographically appears as a solid and heterogeneous echoic appearance with hyperechoic rim or lamellated hyper- and hypoechoeic appearance [2, 7].

The present case is an angiomyxoma in the spleen of a dog, exhibiting histopathological, immunohistochemical and sonographical features of angiomyxoma. In veterinary medicine, only two angiomyxoma cases had been reported in the peritoneum of a cow and kidney of a dog [5, 6].

The angiomyxomas are generally benign tumors with a slow growth pattern characterized by the absence of metastasis and lack of nuclear pleomorphic or mitotic activity. In human cases, 47% of the patients experienced recurrence following surgical excision [3]. The high recurrence rate of angiomyxoma was assumed to be due to incomplete excision as result of aggressive infiltration of the tumor into the surrounding soft tissues. In the present case, the location of the tumor allowed facilitated excision via splenectomy. Therefore, there is no possibility of recurrence at the same site. However, intravascular tumor embolus expressing α-SMA was one of most interesting findings of this case, which necessitates, careful observation considering the associated risk of recurrence at another location.

In conclusion, we report a case of splenic angiomyxoma in a dog. This observation carries a high importance, because this tumor is extremely rare in this species and has been previously reported only in one case. Particularly, the spleen as the anatomical site of occurrence was unusual, as to the author's knowledge, to date this was not even reported in human. Interestingly, intravascular tumor embolus expressing α-SMA was observed indicative of a possibility of metastasis.

ACKNOWLEDGMENTS. This research was supported by the Agricultural Biotechnology Development Program, Ministry of Agriculture, Food and Rural Affairs [312062-5] and the Kyungpook National University Research Found, 2015.

REFERENCES

1. Buckley, C. H. 2000. Tumors of the vulva. pp. 723–724. *In*: Diagnostic Histopathology of Tumors, 2nd ed. (Flecher, C. D. M. ed.), Churchill Livingstone, London.
2. Cesarani, F., Garretti, L., Denegri, F., Valente, G. and Rossetti, S. R. 1999. Sonographic appearance of aggressive angiomyxoma of the bladder. *J. Clin. Ultrasound* **27**: 399–401. [Medline] [CrossRef]
3. Chan, Y. M., Hon, E., Ngai, S. W., Ng, T. Y. and Wong, L. C. 2000. Aggressive angiomyxoma in females: is radical resection the only option? *Acta Obstet. Gynecol. Scand.* **79**: 216–220. [Medline] [CrossRef]
4. Fletcher, C. D. M. 2000. Soft tissue tumors. pp. 1520–1521. *In*: Diagnostic Histopathology of Tumors. 2nd ed. (Flecher C. D. M. ed.), Churchill Livingstone, London.
5. Gajanayake, I., Priestnall, S. L., Benigni, L., English, K., Summers, B. A. and Garden, O. A. 2010. Paraneoplastic hypercalcemia in a dog with benign renal angiomyxoma. *J. Vet. Diagn. Invest.* **22**: 775–780. [Medline] [CrossRef]
6. Opsomer, G., De Bosschere, H., Vanroose, G., Hoflack, G., De Vliegher, S. and de Kruif, A. 2001. Aggressive angiomyxoma in a cow. *Vet. Rec.* **149**: 594–595. [Medline] [CrossRef]
7. Tariq, R., Hasnain, S., Siddiqui, M. T. and Ahmed, R. 2014. Aggressive angiomyxoma: swirled configuration on ultrasound and MR imaging. *J. Pak. Med. Assoc.* **64**: 345–348. [Medline]