BRIEF NOTE

IgG Type Myeloma in a Dog

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Although IgA and IgG type myelomas are frequent in man, only a few cases have been described in domestic animals. Of more than 30 cases of canine myeloma reported in Europe and America, most were shown to be of IgG except for 2 cases of IgA type [2, 7]. This report is to describe a case of canine IgG type myeloma.

An 11-year-old male dog of Akita breed weighing 30 kg, showed depression and spontaneous hematuria since a few days, and a considerable number of microfilariae were demonstrated by hematological examination. Based upon diagnosis as systemic depression due to filariae, a surgical operation was made to remove the parasites from the heart through the vena jugularis. However, adult filariae could not be manipulated out, and death occurred 6 hr later.

The case had severe anemia (Ht: 22%), hyperproteinemia, elevated glucose level (130 mg/dl) and increased leukocyte (16,200/mm) and plasma cell (3%) counts in peripheral blood (Fig. 1). Electrophoresis on cellulose acetate and immunoelectrophoresis were performed with the patient's serum, revealing a monoclonal hypergammaglobulinemia (total serum protein: 12.5 g/dl, albumin: 0.8 g/dl, α_1 -globulin: 0.2 g/dl, α_2 -globulin: 0.7 g/dl, β -globulin:

2.3 g/dl and γ -globulin: 8.5 g/dl) (Fig. 2). The immunoelectrophoretic analysis in agar gel was made with anti-dog whole serum, anti-dog IgG2ab, and anti-dog IgM rabbit serum after electric charge at 85 V for 45 min. The results indicated a predominance of IgG regions, especially of IgG2ab (Fig. 3). The estimated values were: IgG2ab, 55.6 mg/ml; IgM, 0.53 mg/ml.

Necropsy was carried out 18 hr after death. The mucosa appeared pale. The right ventricle of the heart was enlarged containing about 50 adult filaria worms. The lungs were edematous and hyperemic with a few small lesions of calcification surrounding dead filariae. There was no increase in abdominal fluid. Marked splenomegaly (8×22×2.5 cm, 390 g) was noted containing a small amount of blood. The cut surface of the spleen was dark grayish-red in color and trabeculae were not clearly visible. The liver was slightly enlarged and strongly congested with clearly visible lobular structure. No gross lesions were noted in the kidney. The urinary bladder contained some bloody turbid urine and had diffuse and focal petechiae on the mucosa. Petechiae were also seen on the mucosa of the pylorus to

the jejunum and intestinal content was watery and black-brown in color.

Tissues of each organ were fixed in 10% neutral formalin solution, embedded in paraffin and sectioned at 4 μ m. All sections were stained with hematoxylin and eosin. Selected ones were stained with methyl green-pyronine, toluidin blue, Congo red or subjected to peroxidase reaction. For electron microscopy, samples were taken from formalin-fixed spleen tissue, and after washing thoroughly with phosphate buffer, they were fixed further with 5% glutaraldehyde solution at pH 7.2. Ultrathin sections were made from blocks embedded in Epon 812, stained with uranyl acetate and lead nitrate, and observed with a JEM-100S electron microscopy at 80 Kv.

In the spleen the whole red pulp was occupied by proliferated myeloma cells with considerable deposition of hemosiderin (Fig. 4). The white pulp and trabeculae were severely atrophied. The myeloma cells varying in size and shape having sometimes vacuolated in cytoplasm, were basophilic, pyroninophilic, and weakly PAS positive. Metachromasia was not positive. Many of them had a nucleus with "cartwheel" fashion. Some of them had a larger indented nucleus and others two or three nuclei. Mitotic figures were rare. Electron microscopy revealed that most of tumor cells were about 10 to 25 μ m in diameter having well-developed rough endoplasmic reticulum with distended cisternae, in which an electron dense material probably of immunoglobulins was accumulated (Fig. 5). Chromatin was dense in the periphery of the nucleus and nucleolus was not clearly demonstrated.

Many plasma cells existed also around the follicles of the tonsil and in the subcapsular and medullary sinuses of the submaxillary lymph nodes. In the red marrow

of the femur, diffuse proliferation of myeloma cells was seen, while there existed other elements than myeloid ones (Fig. 6). There were a few abnormal plasma cells as seen in the spleen.

In the severely congested liver with slightly fibrous thickening of interstitial tissue, many myeloma cells were seen within dilated sinusoids (Fig. 7). Cirrhotic tendency was not recognized. Focal accumulations of myeloma cells were present in the cortical stroma of the kidney but no amyloid deposition and glomerular lesions were seen. In the lamina propria of the urinary bladder, there were small hemorrhagic foci with slight infiltration of myeloma cells. Also in interlobular regions of the prostate a small number of myeloma cells were seen. The stomach and intestine showed desquamation of the mucous epithelial cells with strong congestion, and hemorrhagic foci were present in the tunica propria without infiltration of the tumor cells. In the blood vessels of many organs microfilariae were frequently encountered.

A tendency of higher incidence of myeloma in aged male dogs was described by Osborne et al. [5], and the present case was of 11-year-old male. No skeletal lesions were noted, while lameness and pain associated with lesions of the skeleton have been reported in many cases of canine myeloma [1, 5, 6, 8]. However, severe anemia, hyperglobulinemia, hemorrhagic tendency and intense proliferation of tumor cells in extraskeletal regions, especially in the spleen [1, 5, 6, 8], were observed also in the present case.

In the spleen some tumor cells had morphology of typical plasma cells as those seen in other organs, but there existed also other types of cells being larger with two or three vesicular nuclei, which were

described by Moulton [3] as much less differentiated cells. These seemed to be precursor cells, suggesting that the tumor was originated from the spleen. In other cases of canine myeloma, the tumor was described to form nodular masses in various parts of the body [2, 4, 5, 8]. This case, however, had only diffuse proliferation of the tumor cells. Oduye et al. [4] reported amyloid deposition in the kidney of his case of canine myeloma but it was not seen in any organs of this case supposedly because of relatively short history of the disease.

Although the present case had filaria infection, it might be difficult to propose a triggering effect of filariasis for myeloma because of infrequent incidence of myeloma in dogs with very high incidence of filariasis in Japan.

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要 約

イヌの IgG 型骨髄腫の 1 例について (短報): 高橋公正・片見一衛・中村和博・友田 勇・藤原公策 (東京大学農学部家畜病理学教室, 家畜内科学教室)——家畜における骨髄腫はきわめてまれである。本例は 11 歳雄秋田犬で生前, フィラリア寄生と突発的血尿がみられ, 血清学的には骨髄腫特有の monoclonal な高 γ -グロブリン血症を示し, IgG2ab 成分が増加していた。剖検では顕著な脾腫がみられ, 組織学的には脾をはじめとし各臓器に骨髄腫細胞の浸潤増殖像がみられた。腫瘍細胞の増生はむしろ骨髄外性に著明で, 脾原発が推定された。

Explanation of Figures

Fig. 1. Plasma cells in the peripheral blood with vacuolated cytoplasm and eccentrically located dense nuclei. Giemsa stain. $\times 1,200$.

Fig. 2. Electrophoretic pattern of the patient serum on cellulose acetate showing a predominant spike of gamma globulin and small peak of albumin.

Fig. 3. Immunoelectrophoresis of sera from the patient (M) and a normal dog (N) against anti-dog serum (1) and anti-dog IgG2ab (2). G= purified canine IgG.

Fig. 4. Proliferation of myeloma cells in the red pulp of the spleen. Hematoxylin-eosin (HE) stain. $\times 350$.

Fig. 5. Electron microscopy of a tumor cell with distended cistern of endoplasmic reticulum in the spleen. Bar=2 μ m. $\times 9,000$.

Fig. 6. Diffuse proliferation of myeloma cells in the bone marrow. HE stain. $\times 190$.

Fig. 7. Clumps of tumor cells within the liver sinusoid. HE stain. $\times 350$.