EVALUATION OF PATHOMORPHOLOGICAL SPLENIC LESIONS IN DOGS FROM THE LUBLIN REGION IN 2005-2008

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Abstract

The study aimed at the analysis of splenic pathologic lesions in mix-breed dogs of varied age and sex in the Lublin Province in 2005-2008. The research material comprised 33 spleen specimens collected both during surgery and post mortem. The material was fixed in 4% buffered formalin, dehydrated, and paraffin-embedded. The 4-µm-thick sections were stained with haematoxylin and eosin. The non-cancerous lesions were detected in young dogs under 2 years of age. Angiosarcoma proved to be the most common lesion and accounted for over 36% of total cases, followed by haemangioma recognised in above 27% of all cases. Nodular hyperplasia, hyperaemia, histiocytic sarcomas, haemangiopericytomas, lymphomas, and necrotic lesions were observed in notable minority of cases.

Key words: dog, spleen, pathomorphological analysis.

Spleen, an organ of a peculiar anatomy and physiology, is most frequently described together with the digestive tract. However, there is no close functional or anatomical relationship between them, and their topography is the only reason for the connection. Canine spleen weight ranges between 8 and 147 g (in middle-sized dog it averages 50 g). In some dog breeds a specific predilection of spleen position and size is observed. In Cocker Spaniel and Miniature Schnauzer dogs, this organ is localised more caudally in the abdominal cavity (3).

The spleen plays a significant role in the immune system. It has haematopoietic abilities, serves as a vital iron store, because of the continuous removal of senile or damaged erythrocytes. Moreover, the spleen filters a substantial proportion of total cardiac output, captures particulate and other antigenic materials from the bloodstream, which gives it a crucial role in early immune response and immune-mediated diseases. A large part of tumours diagnosed in our department concerns the abnormalities in spleen.

The objective of this research was to determine the types of pathomorphological lesions of canine spleen material submitted to the Department by histopathological evaluation, and present the obtained data in relation to dog’s age, sex, and breed.

Material and Methods

The research material included 33 splenic samples obtained during surgery and post mortem from dogs of various breeds from the Lublin Province. All samples were subjected to histopathological examination. Age, sex, and breed of the animals were recorded. Abnormal macroscopic features of the spleens were an indication for histopathological evaluation. The material was fixed in 4% buffered formalin, dehydrated, and paraffin-embedded. The 4-µm-thick sections were stained with haematoxylin and eosin (H E). The histopathological diagnosis served as a basis for lesions’ classification into cancerous and non-cancerous tissues.

Results

The analysis of the research material revealed that neoplastic changes represented 72.73% of total lesions. The non-neoplastic changes were recognised in 27.27% of total cases. The types of the lesions and their incidence are presented in Table 1.
Fig. 1. Local necrosis of spleen. HE. 100x

Fig. 2. Angiosarcoma. HE. 100x

Table 1
Incidence of lesions in spleen

<table>
<thead>
<tr>
<th>Type of pathological lesion</th>
<th>Number of cases (%)</th>
<th>Mean age of animals</th>
<th>Breeds of dogs (number)</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angiosarcoma</td>
<td>36.36</td>
<td>10</td>
<td>Mixed breed (6)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Deutscher Boxer (3)</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>St. Bernhardshund (1)</td>
<td>-</td>
<td>1</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Rottweiler (1)</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Schnauzer (1)</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>3 -</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemangioma</td>
<td>27.28</td>
<td>6</td>
<td>Mixed breed (8)</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Beagle (1)</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Nodular hyperplasia</td>
<td>12.12</td>
<td>12</td>
<td>Mixed breed (3)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Maltese (1)</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Hyperaemia</td>
<td>12.12</td>
<td>3</td>
<td>Mixed breed (2)</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dachshund (1)</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bullmastiff (1)</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Hystiocytic sarcoma</td>
<td>3.03</td>
<td>11</td>
<td>Schnauzer (1)</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Haemangiopericytoma</td>
<td>3.03</td>
<td>9</td>
<td>Mixed breed (1)</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>3.03</td>
<td>9</td>
<td>Mixed breed (1)</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Necrosis</td>
<td>3.03</td>
<td>2</td>
<td>Yorkshire terrier (1)</td>
<td>1</td>
<td>-</td>
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</tbody>
</table>
Out of the benign primary neoplasms, haemangiomas proved to be the most frequent and comprised 27.28% cases, while malignancies – 45.45% of total cases. According to the presented results, angiosarcoma was recognised in the most cases, i.e. 36.36% of total of malignant tumours. This tumour made up 80% of all malignancies. Histiocytic sarcomas were reported in 3.03% of the cases, that constituted 6.67% of all malignancies. The same findings concerned haemangiopericytoma and lymphoma. Nodular hyperplasia accounted 12.12% of all splenic lesions, which represented 44.44 cases of a non-neoplastic nature. The same results concerned hyperaemia. The pathological non-neoplastic changes were found in young animals of age 2 and 3 years, and older – 12 years old. The rarest observed non-cancerous lesion appeared to be necrosis, which made 3.03% of total splenic changes and 11.11% of non-neoplastic cases. Necrotic lesions displayed some foci of hyperaemia at the margin as well as inflammatory cell infiltrate (Fig. 1).

Malignant lesions (angiosarcoma, hystiocytic sarcoma, haemangiopericytoma, lymphoma) occurred in older animals 9-11 years of age. Angiosarcoma parenchyma was composed of cells of endothelial origin that formed erythrocyte-filled vascular spaces of varying size (Fig. 2). Benign neoplasms were diagnosed in 6 years old dogs. Histological evaluation revealed that haemangiomas made a complex network of disorganized intermingled capillaries with exuberant proliferation of endothelial cells promoting growth of new capillary blood vessels.

The highest number of angiosarcomas was observed in six mixed-breed dogs (four females and two males), whereas angiomas in eight mix-breed dogs (five males and three females). Splenic hypertrophic nodules occurred in three mixed-breed dogs (two females and one male). The other histopathological lesions were rare.

**Discussion**

A standard preliminary clinical examination allows to recognise some abnormalities within the spleen area (splenomegaly), while the modern imaging modalities, RTG and USG confirm the diagnosis. The advanced potential imaging technique like computed tomography (CT) is helpful in localisation of some problematic foci and discrimination between malignant and benign lesions (16). One of the latest diagnostic tools is magnetic resonance imaging, which proves to be 100% sensitive and 90% specific in differentiation of malignant changes from benign ones (1). However, this imaging modality is rarely used in veterinary practices. The definitive diagnosis relies on histopathological evaluation. Enlarged spleen in a diffuse or focal form is often reported in animals (1, 2, 4, 11, 15). This type of pathological changes needs discrimination between neoplastic and non-neoplastic lesions. As for the latter ones, commonly they manifest so-called splenic nodular proliferation that usually occurs in dogs over 10 years of age. Nodules or masses are small circular abnormalities that appear as a solitary nodule or multiply nodules, most frequently in an encysted form. Macroscopically, cross-sectional examination exhibits their dark red colour, occasionally pink with sporadic necrotic areas. In microscopic view, multiple mononuclear cell clusters with small nuclei are observed. As the forms are not surrounded with any connective tissue capsule, they press the fragments of normal tissue and smoothly penetrate the red pulp tissue. Some authors emphasise a lack of reliable scientific evidence to support any association with the malignant transformation (5). Other non-cancerous lesions worth considering are haematomas, which are frequently identified in dogs after a motor vehicle accident or some traumatic injury. These are usually subcapsular haematomas well-circumscribed and demarcated from the intact tissue. It is noteworthy that this type of lesions is practically found incidentally during surgery and laparotomic approach (2). In these cases the splenic capsule adheres to the adjacent organs, predominantly the omentum. Another type of non-neoplastic lesions are spleen infarctions, which are associated with other conditions connected with e.g. blood coagulability and represent approximately 1% of cases (2).

The cancerous lesions include so called primary neoplasms and secondary neoplasms with multifocal changes. The primary neoplasms of a benign nature comprise haemangiomias, which are divided into simple angiomas and cavernomas, depending on a type of tissue they are composed (flaccid or compact structure). Simple angiomas are composed of capillary-sized vessels lined by flat endothelial cells, whereas cavernomas show irregular cavernous vessels lined with endothelium and filled with erythrocytes.

Angiosarcoma is the most frequently reported malignant neoplasm of the spleen in dogs (2, 10, 15). Some reports indicate that computed tomography adds value to the diagnostic process and serves as a potential adjunctive diagnostic aid. However, significant differences in tomography density measurements of neoplasm tissue (Hounsfield units) are critical as they allow for initial diagnostic separation of benign lesions from angiosarcomas (9). The neoplasm development is described according to the following staging system (three stages), stage I - tumour confined exclusively to the spleen, stage II – multiple spleen ruptures present, and stage III – advanced cancer metastatises to the kidneys, stomach, intestines, liver, and heart (6-8). Frequently, differential diagnosis involves immunohistochemical staining with antibody against factor VIII (3). A negative reaction with this antibody is obtained for haemangiopericytoma, fibrosarcoma, and leiomyosarcoma, whereas a positive staining to anti-factor VIII related antibody and vimentin is observed for haemangiosarcoma and haemangioma. Contrary to haemangiosarcomas, lymphangiosarcomas are characterised by a notably weaker positive reaction with antibody against factor VIII. They contain few or no erythrocytes. Additionally, some sites with disorganised cells, separated by bands of collagen fibers can be observed. These cells possess small amount of acidophilic cytoplasm (12, 13). Some authors report the
incidence of concurrent cardiac neoplasms associated with splenic tumours (8). Lymphomas identified in canine spleen are very rare and make approximately 3% of all lesions recognised in the spleen. They are most common in Rottweilers, crossbreds, and German Shepherd dogs. According to some other studies, feline lymphomas are observed more often and represent 9% of all lesions and 38% of neoplasms diagnosed in this organ. Histiocytoma as a malignant tumour is considered to be a sequel of fibrous histiocytic nodular proliferations. There are identified histiocytes, plasmatic cells, fibroblasts, and lymphocytes (14).

Complete splenectomy, as a radical surgical procedure, is currently indicated for neoplastic conditions of the spleen (10). Despite the important functions performed by the spleen, this organ is not essential for life and its function can be taken over by mononuclear phagocyte system in the lymph nodes, liver, and bone marrow. As a rule, the survival rate after total splenectomy is dependent on the presence of metastases in other organs or post-operative complications (2).

References