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Neoplastic Diseases of Dogs and Cats

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Neoplasms originating from various tissue elements constitute a large and significant group of pathologic conditions in dogs and cats. There can be little doubt that neoplasia has attracted increasing interest on the part of veterinarians and pathologists.

The occurrence of neoplasms in animals depends on several factors, such as age, breed, and sex.

There is a peak age of tumor incidence for each species of animal: 6–10 years in the dog and cat, 5–13 years in the horse and cow, and 2 years for chickens. There are some exceptions, for example, osteosarcoma and histiocytoma, which occur in dogs 1 to 4 years old and also develop at an early age in cats.

In the dog it is generally agreed that the Boxer breed has a high incidence of tumors and that the Pekingese and Chow seldom develop neoplasms.

The over-all incidence of tumors in females is greater than in male dogs. This may be due to the frequency of mammary gland neoplasms.

The cause of tumors is unknown; however, some factors such as viruses, irradiation, trauma, and some hereditary and congenital factors definitely contribute to the development of tumors. Precancerous lesions in the form of regenerative, inflammatory or hyperplastic processes sometimes become neoplastic.

Although many different types of neoplasms occur in dogs and cats, only a few of the more important ones will be discussed.

LYMPHOID NEOPLASMS

Malignant proliferation of lymphoid series or its precursors, the reticulum cells, are far more frequent than disorders of granulocytic or monocytic series. To this large group pathologists apply the term malignant lymphoma, within which the growth may be distinguished by cell types, such as lymphocytes and lymphoblasts (lymphosarcoma), and reticulum cells (reticulum cell sarcoma). When the prominent clinical finding is the presence in the blood of lymphoid cells either in large numbers or in abnormal or primitive forms, the term lymphoid leukemia is employed.

Neoplasms originating in lymphoid tissues constitute a significant group of tumors of animals. In dogs and cattle the predominant form of lymphoid neoplasia is more or less generalized throughout the body and often may be readily recognized by palpation of the superficial nodes; in the cat, on the other hand, there is a locally malignant tumor with a diffuse infiltrative type of growth with an apparent preference for the abdominal organs such as kidney, liver, and visceral lymph nodes. In the dog the earliest involvement is usually in the lymph nodes of the head and neck. The next in order of frequency are mediastinal, mesenteric, popliteal, sublumbar, and bronchial nodes. Mediastinal
location should be kept in mind as a significant predilection for cats. This location of the lesion results in a gagging cough, difficulty in breathing, and accumulation of fluid in the pleural cavity.

Neoplastic lymph nodes are enlarged and moderately firm, but a few soft, necrotic areas may occur. The capsule is tense with no demarcation between cortex and medulla, and the tissue is usually smooth and glistening on transverse sections. The color is usually paler than normal.

The spleen, when involved, presents diffuse or nodular enlargements; it may be enlarged several times. The neoplastic area is turgid and friable. The trabecular and follicular margins are usually lost. Affected liver is also enlarged, turgid and friable. The neoplastic areas often appear as minute, pale foci with streaks disseminated throughout the parenchyma.

The kidney is one of the most common sites in the cat and also may be involved in dogs. It usually is affected bilaterally and so enlarged that it may be readily palpable. Usually the kidney is knobby with pale, firm elevations appearing on the surface. With some reticulum cell sarcomas the kidney may be diffusely enlarged and the cortex homogeneously thickened and pale.

Tumor formation occurring in the intestine of cats often is evident grossly. The terminal part of the ileum is involved more often than the duodenum, jejunum, cecum or colon. The lesion appears as a pale, firm, annular thickening involving the muscular and submucosal layers.

Occasionally other organs, such as the heart, tonsil, thymus, central nervous system, and bone marrow are involved.

Diagnosis of lymphoid tumors can be made on the basis of clinical examination, radiography, or exploratory surgery. Pathognomonic changes in the white blood cell picture are absent in a great percentage of lymphoid malignancies. In cats lymphoid cells appear in the blood in large numbers or immature forms in only about 15 per cent of lymphoid malignancies.

Occasionally cats have a leukopenia in lymphoid malignancies. Even in this case a differential study is of great importance, since the presence of a few reticulum cells or abnormal or primitive cells of the lymphoid series may be used as a clue to the underlying disease process. Progressive leukopenia associated with hepatomegaly may indicate a lymphoid malignancy.

In most acute forms of lymphoid leukemia the total white blood cell count may reach 260,000/cmm. Lymphoblasts may constitute up to 95 per cent of these white blood cells. Lymphoblasts are large mononuclear cells with a rim of deep blue cytoplasm, a reddish-purple nucleus, and pale or basophilic nucleoli. More primitive cells exhibiting mitotic figures are not uncommon. In less acute cases there may be both lymphoblasts and lymphocytes, many of the latter being abnormal, with folded, kidney-shaped or multilobed nuclei and cytoplasmic vacuoles or granules.

In rare instances, the predominant leukemic cells may be reticulum cells.

**MYELOID NEOPLASMS**

Myeloid leukemia is a rare neoplasm in domestic animals. These arise from the myeloid cells of the bone marrow. Few cases have been reported in dogs and cats. Most of these tumors arise from the marrow of long bones or of the vertebrae. Spleen, liver, and lymph nodes are usually affected and may be metastatic sites. On rare occasions the bone marrow is unaffected.

Lymph nodes may or may not be enlarged. The marrow is abundant and white or greyish red. The spleen is often enlarged and greyish in color. The liver manifests greyish areas of tumor in the portal areas.

The diagnosis of myelogenous leukemia can be made on the basis of findings of immature myeloid cells, including blasts, in peripheral blood examination. The bone marrow is most often hypercellular with a marked hyperplasia of the myelogenous series. Basophil leukemia is apparently one of the more common types in the dog and cat.

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BONE NEOPLASMS

Bone tumors are more frequently observed in large breeds of dogs. The Great Dane seems to have a tremendous predisposition to osteosarcoma of the long bones. Osteosarcoma is fairly common in cats. The forelegs, which bear about 10 per cent more weight than the hind legs, are affected almost twice as often as the hind legs. Most commonly affected bones are the radius, humerus, and tibia. One of the common sites of metastasis is the lung.

Other types of bone tumors are chondrosarcoma, fibrosarcoma, hemangiosarcoma, and reticulum cell sarcoma, which are observed less frequently than osteosarcoma.

GENITAL NEOPLASMS

Dogs, and less frequently cats, are victims of neoplasms of gonads and accessory sex glands. Among these, interstitial cell adenoma, Sertoli cell tumors, and seminoma are the most common tumors of the gonads of the male dog. These are seldom seen in cats. Cryptorchidism is a predisposing factor for testicular neoplasia.

Interstitial cell adenomas are usually seen as multiple, small, discrete areas in the testes. The color is from light yellow to brown. Areas of hemorrhage may be seen. This tumor very seldom metastasizes.

Many of the animals with Sertoli cell tumors exhibit a typical clinical syndrome due to the abnormal amount of estrogen produced by the neoplastic cells. This includes alopecia, gynecomastia, squamous metaplasia and enlargement of the prostate and atrophy of the uninvolved testis. The involved testicle generally conforms in shape. Its consistency is usually hard due to the abundance of collagenous connective tissue. Metastatic lesions, which are rare, have been found in the pelvic lymph nodes, lungs, and kidney.

The seminoma is usually unilateral and solitary. They usually conform to the shape of the testis. They are lobulated by delicate, fibrous septa. Seminoma rarely metastasizes, and when it occurs, it is seen in pelvic lymph nodes and lung.

Mammary tumors are frequently observed in dogs and cats. Among the mammary tumors, mixed mammary tumors of the bitch are most common. They are present usually in the teat, buried in an otherwise normal-appearing gland or occupying the entire gland. Mixed tumors are well encapsulated and freely movable. These tumors often contain bone and cartilage. Next to mixed tumors in incidence is adenocarcinoma, which usually occupies a large part of the mammary gland. These tumors are poorly encapsulated and usually very infiltrative. Metastasis occurs in about 25 per cent of the malignant mammary neoplasms. The route of metastasis is usually via lymphatics, and neoplastic elements may be seen in regional lymph nodes and lungs.

CUTANEOUS NEOPLASMS

Tumors involving the skin and subcutaneous tissue comprise the majority of tumors in dogs and cats. Some of the more common skin tumors affecting dogs and cats are the mast cell tumor, histiocytoma, squamous cell carcinoma, basal cell carcinoma, perianal gland tumor, sebaceous gland tumor, sweat gland tumor, and ceruminous gland tumor. Among these, mast cell tumors (benign and malignant) constitute about 20 per cent of all the skin tumors in dogs. They can metastasize to the liver, spleen, and bone marrow. Recurrence of this tumor occurs in approximately one-fourth of the cases of surgical removal. Recurrent growths are usually more anaplastic than the primary tumor.

Histiocytomas generally have a history of rapid growth; however, there has been no report of metastasis. This neoplasm is more prevalent in younger dogs, with incidence increasing before the cancer age is reached.

Squamous cell carcinoma has been found in all areas of the skin; however, the skin of the trunk, legs, digits, scrotum and lips is particularly involved in dogs. The head and neck are predilective sites for cats. These tumors infiltrate widely.
and may exhibit metastasis to regional lymph nodes and lungs. Metastasis may be widespread. Basal cell carcinoma, perianal gland tumor (benign and malignant), sebaceous gland tumor (benign and malignant), sweat gland tumor (benign and malignant) and ceruminous gland tumor (benign and malignant) are more common in dogs than in cats and rarely metastasize.

**GASTROINTESTINAL NEOPLASMS**

Primary neoplasms of the gastrointestinal tract are relatively uncommon in dogs and cats, except for oral papilloma, melanoma, and epulis. These tumors are more common in dogs than in cats. Oral papilloma is of viral etiology and is contagious. It can be transmitted by scarification with whole cells or cell-free filtrates. It affects the buccal mucosa and palate.

Melanomas are very common in the oral cavity of dogs and cats. They are considered by many to be capable of becoming malignant and metastatic. The term "epulis" is used here for a tumor, although some authors use it for chronic inflammatory tissue or granulation tissue of the gingiva. Epulides usually are pedunculated or nodular masses on the gingiva. Often these are hard, due to the presence of fibrous connective tissue and even bone. Ulceration of the surface is common as a result of trauma. Recurrence following surgical removal is common.

**RESPIRATORY NEOPLASMS**

Epithelial neoplasms of the upper respiratory tract are infrequently observed. Most lung carcinomas have their origin in the epithelium of bronchi and bronchioles. Bronchogenic carcinoma usually develops as a solitary mass, most often in the dia-phragmatic lobe, and spreads by infiltration to other parts of the lung. It is common to see metastasis into the pleura, diaphragm, mediastinum, and bronchial lymph nodes.

**DIAGNOSIS AND TREATMENT**

Diagnosis of tumors in general is difficult without the help of histopathology. Accurate diagnosis and a thorough knowledge about the type of tumor is essential for making a prognosis. In order to accomplish this, it is necessary to utilize some of the simple diagnostic tools, such as hematologic examination, exfoliative cytology, or biopsy in consultation with a pathologist. Biopsy and microscopic identification of neoplastic cells is one of the most accurate, reliable, and simple methods of diagnosis. In submitting a biopsy, the clinician should provide the pathologist with an adequate history, as well as both a portion of tumor and a small portion of the apparently normal adjacent tissue. In case of tumors of bone, biopsy may result in dissemination of tumor cells in very rare occasions.

The most commonly employed mode of treatment is surgical removal. In case of malignant tumors, it is essential to remove the neoplastic tissue as well as the regionallymphatics, since metastasis by way of lymphatics is common. Other modes of treatment, such as X-irradiation, are not widely used in veterinary medicine at the present time.

**BIBLIOGRAPHY**