



LUNG TUMORS IN PETS

Background

Lung tumors are uncommon in dogs and cats. Like most tumors in animals and people, we do not know why they occur. Tumors typically arise from the glands in the lungs or the lining of the airways. The majority of lung tumors in veterinary medicine are malignant from other primary tumors such as lymphosarcoma or osteosarcoma, with the potential for relatively rapid growth and eventual spread, but some very few tumors are primary lung tissue .

Clinical Signs

The most common presenting complaint for animals with lung tumors is a cough. *Sometimes this cough may initially improve with anti-inflammatory medications or bronchodilator drugs.* Other signs that can be seen include decreased energy level, difficulty breathing, decreased appetite or weight loss, and occasionally, lameness.

Diagnosis and Initial Evaluation

When a pet comes in with a cough, a number of tests are performed. The most useful test is usually **X-rays of the chest**. A lung tumor will often appear as a fairly large, solitary mass in one lung lobe. The most commonly affected part of the lung is toward the back and top of the chest, although tumors can occur in other parts of the lung as well. Some basic blood tests looking at organ function, blood cell number, and any signs of infection or inflammation are also often performed.

Other procedures which may be performed prior to devising a treatment plan include a **fine needle aspirate** of the lung mass, and/or a **CT scan** of the chest. A fine needle aspirate allows a small number of cells from the lung mass to be removed and looked at under the microscope. Confirmation of tumor can be obtained in approximately 80% of cases, and the risk of complications from the procedure is low. A CT scan allows the lung tissue and lymph nodes in the chest to be evaluated with very great detail – areas of tumor in other parts of the lung or enlargement of lymph nodes that may not be detectable on plain X-rays can sometimes be identified. This information can be important for some owners, because dogs treated with surgery have a worse prognosis if areas of tumor spread to the lymph node or other parts of the lung tissue is identified.

Treatment and Prognosis

In those cases where the tumor occurs in such a way that surgery is possible, **surgery** is the treatment of choice. The average survival time after surgery is approximately 1 year. However, the outcome varies considerably depending on (1) The presence or absence of spread to the lymph nodes that drain the lung tissue; *dogs with lymph node involvement live an average of 2 months with surgery alone, while dogs without lymph node involvement live an average of 15 months, with 1/3 doing well for more than 2 years.* (2) The microscopic appearance of the tumor after surgery; *dogs and cats with well differentiated tumors are likely*

to do well for an average of 18 months, whereas dogs and cats with poorly differentiated tumors are likely to develop problems after an average of 2 months.

For lung tumors where there is a poor prognosis after surgery, **chemotherapy** can be considered. There are no studies that prove for certain that animals receiving chemotherapy after surgery do better than animals that do not, however there is encouraging preliminary evidence that the drug **Navelbine (vinorelbine)** may be helpful in delaying or preventing recurrence of lung tumors after surgery. Navelbine is given as an injection into a vein once weekly for 4 weeks, then every other week for an additional 4 treatments. Most pets tolerate chemotherapy very well, with only a small likelihood of developing worrisome side effects (please see the handout CHEMOTHERAPY IN PETS for more detailed information about this type of treatment).

In cases where surgery cannot be performed or has been declined, we will sometimes consider using chemotherapy with Navelbine or other drugs to try to shrink the tumors and improve clinical signs, or at least keep them from growing for as long as possible.

Follow-up

Following the completion of treatment, we recommend that your pet be seen every 3 months for additional X-rays of the lungs. If things go well, rechecks are decreased after 18 months to twice per year. Should evidence of tumor regrowth be seen at some point in the future, additional treatment may be considered.



LYMPHOMA IN CATS

Lymphoma is one of the most common cancers diagnosed in cats. It is a cancer of the lymphocytes (a type of blood cell) and lymphoid tissues. Lymphoid tissue is normally present in many places in the body including lymph nodes, spleen, liver, gastrointestinal tract and bone marrow.

The feline leukemia virus (FeLV) has been shown to cause lymphoma in some cats. Cats with the feline immunodeficiency virus (FIV) are also at higher risk of developing lymphoma. Cats of any age, breed and sex can be affected. We typically see lymphoma in younger cats that are infected with the feline leukaemia virus, and in older cats that are not infected with the virus. Because of the association between these viruses and lymphoma, we will usually recommend that cats with lymphoma be tested for FeLV and FIV.

Types of Lymphoma

Lymphoma can be divided into several different forms, which depend upon the predominant location of the tumor. Some cats have multiple sites of involvement and do not fit well into just one category.

Digestive tract: This is the most common form. The digestive tract includes the stomach, intestines and liver as well as some of the lymph nodes surrounding the intestines. Cats with this type of lymphoma may have vomiting, diarrhea, weight loss or a decreased appetite.

Mediastinal: The mediastinum is a term used for a special group of lymph nodes in the chest. Cats with this type of lymphoma often are seen because of difficulty breathing due to a large mass in the chest or an accumulation of fluid around the lungs.

Kidney: The kidneys may be the primary sites of involvement. Cats that have this type are often seen because of signs related to kidney failure (increased thirst, increased urination, loss of appetite, vomiting).

Bone marrow: If the cancer were confined to the bone marrow, we would call this leukemia. The signs that we see in cats are usually related to the decreased numbers of normal cells (such as red blood cells that carry oxygen, white blood cells that fight infection and platelets that help with clotting) which are made in the bone marrow.

External lymph nodes: In a few cats, the only site of involvement is the external lymph nodes. These cats may be seen because of problems such as vomiting and loss of appetite, or because the owner notes "lumps" (enlarged lymph nodes) on their cat.

Other sites: We will occasionally see other sites such as the skin, nose, brain, and spinal cord as the primary site of involvement.

Diagnosis/Initial Evaluation

A biopsy or cytology sample is required in order to make a diagnosis of lymphoma. In some cases, we can obtain a diagnosis without surgery. However, in some cases, we may need to perform a surgical biopsy to obtain adequate tissue to confirm the diagnosis. The ease with which a diagnosis can be made depends upon where the tumor is located.

A complete evaluation of a cat suspected of having lymphoma includes a search for tumor involvement in other locations (this is what we call staging). A complete blood count (CBC),

a serum chemistry profile, urinalysis and FeLV/FIV testing are always performed and provide important information regarding the effects of the cancer on body functions as well as the ability of the patient to tolerate chemotherapy. An abdominal ultrasound allows us to evaluate the liver, spleen, internal lymph nodes and intestinal tract for possible lymphoma involvement. Chest x-rays allow us to look for internal lymph nodes, lung involvement, an enlarged mediastinum, or fluid around the lungs. A bone marrow aspirate allows us to look for tumor cells in the bone marrow as well as to evaluate the marrow's ability to produce normal blood cells. Once we have these results, we can then provide better information regarding the outcome with treatment.

Treatment/Prognosis

Chemotherapy is the mainstay of treatment for most forms of lymphoma in cats. There may be some situations when surgery (e.g. to get a biopsy or to remove an intestinal mass) may also be indicated; usually this is in addition to chemotherapy. Specific recommendations will be discussed with you based on your pet's particular situation.

Lymphoma is very responsive to chemotherapy and up 75% of treated cats will go into remission. The definition of remission is the complete disappearance of all signs of cancer. However, microscopic amounts of tumor cells can remain hidden in the body. A remission is NOT a cure but it does allow your pet to experience a good quality of life. Because of this, chemotherapy should not be discontinued as soon as a remission is obtained. The length of the remission depends upon many factors, including the primary site, how sick an animal is at the start of treatment, feline leukemia status, and the extent of disease. Using the most aggressive treatment, the average remission and survival times are between 6-8 months; however approximately one third of cats may do well for a considerably longer period of time (longer than 2 years).

The exact drugs and schedule will depend upon the microscopic appearance of the tumor, how sick an animal is at the start of treatment and any abnormalities in organ function (especially important are changes in kidney and liver function). On a typical schedule, your cat will receive weekly treatments for the first 2 months, the every other week for another 4 months. Several different drugs (vincristine, cyclophosphamide, doxorubicin) are alternated (or combined in some cases) in order to reduce the chance that tumor cells will become resistant and to reduce the risk of side effects. Some of the drugs are given by injection and some are sometimes given orally (this can be done at home). Oral prednisone is also included in the treatment plan. Blood tests and/or x-rays/ultrasound are generally repeated at regular intervals to look for side effects (such as a low white blood cell count) and to determine if an animal is in remission.

There are other, less aggressive chemotherapy protocols that can be utilized as well that have varying degrees of effectiveness.

Some cats with intestinal lymphoma that is determined to be "low-grade" by the pathologist may benefit from a simpler chemotherapy protocol, involving the oral administration of two drugs (prednisone and chlorambucil).

Most cats tolerate chemotherapy well and have minimal side effects. Serious side effects are seen in less than 5% of the cats treated. If they are serious or intolerable, we can consider either lowering the dose of the offending drug or substituting a different drug. Side effects might include nausea, vomiting and loss of appetite, diarrhea, tiredness or infection. Cats do not lose their hair, but may lose their whiskers and have a different texture to their fur. Please also see our handout CHEMOTHERAPY IN PETS.



LYMPHOMA IN DOGS

Lymphoma is a relatively common cancer in dogs. It is a cancer of lymphocytes (a type of white blood cell) and lymphoid tissues. Lymphoid tissue is normally present in many places in the body, including lymph nodes, spleen, liver, digestive tract and bone marrow. In most cases, we cannot tell what causes lymphoma.

The most common form of lymphoma in dogs is involvement of one or more of the external lymph nodes. Many dogs may not feel sick or may have only very mild signs such as tiredness or decreased appetite. Other dogs may have more severe signs such as weight loss, vomiting, diarrhea, excessive thirst or urination, weakness, or difficulty breathing. The severity of the signs depends upon the extent of the disease and on whether the cancer has caused changes in organ function. Often, the only noticeable sign is an enlargement of the lymph nodes under the neck, behind the knees or in front of the shoulders. Other organs, such as the liver, spleen and bone marrow can be involved as well.

Diagnosis/Initial evaluation

A complete evaluation of a dog suspected of having lymphoma involves obtaining a biopsy or needle aspirate of the affected tissues and a search for lymphoma in other locations (this is what we call **staging**). A complete blood count (CBC), a serum chemistry profile and urinalysis are always performed and provide important information regarding the effects of the cancer on body functions as well as the ability of the patient to handle chemotherapy. Chest X-rays allow us to look for enlarged internal lymph nodes or lung involvement. A bone marrow aspirate allows us to look for lymphoma cells infiltrating the bone marrow as well as to evaluate the marrow's ability to produce normal blood cells. Special molecular tests can be applied to lymphoma tissue to determine the cell of origin of the lymphoma (B cell vs. T cell). Once we have these results, we can give the owner a more accurate prognosis about the outcome with various types of treatment.

Treatment and Prognosis

Chemotherapy is the mainstay of treatment for lymphoma. Lymphoma is very sensitive to chemotherapy, and up to 95% of dogs treated will go into remission when our most effective treatment protocols are used. The definition of remission is the complete disappearance of all signs of cancer. A remission is NOT a cure but it does allow your pet to experience a good quality of life. It is important to remember this because chemotherapy should not be discontinued as soon as a remission is achieved. The length of remission depends upon many factors including the primary site, how sick an animal is at the start of treatment, blood calcium level, B cell vs. T cell origin, and presence of lymphoma in the bone marrow. For those dogs that have the most common type (external lymph nodes enlarged) and are treated with the most aggressive treatment protocol, the average survival time is about 1 year; approximately 20% of dogs may live longer than 2 years.

There are several different treatment options to consider, depending upon owner preference, how aggressive the cancer is behaving, how sick an animal is at the start of treatment and

any abnormalities in organ function (especially important are changes in liver and kidney function). On a typical schedule, a patient will receive weekly treatments for approximately 4 months. Several different drugs (vincristine, cyclophosphamide and doxorubicin) are alternated in order to reduce the chance that the tumor cells will become resistant, and to reduce the risk of side effects. If a patient remains in remission after 4 months, treatment is discontinued and we will recheck them monthly to insure that remission persists. If and when recurrence of lymphoma is noted, the same drugs are often effective again, although the duration of remission is often shorter.

There are other treatment protocols that require less frequent hospital visits and/or may be less expensive. These may not be quite as effective as our most aggressive treatment, but are considerably better than pursuing no treatment at all. These will all be discussed at the time of your pet's initial visit.

There is some preliminary information that dogs that receive **radiation therapy** (2 treatments to their front half, followed by 2 treatments to their back half 4 weeks later) during their chemotherapy treatment may have a better outcome than those that do not. This treatment is generally well tolerated, but does require 4 brief anesthesia procedures for the delivery of the radiation.

Most dogs will tolerate their chemotherapy well and have minimal side effects. Serious side effects are only seen in about 5% of the patients treated. These could include nausea, vomiting, and loss of appetite, diarrhea, tiredness or infection. Hair loss or slow hair growth may also occur in certain instances. Doxorubicin can cause damage to the heart muscle if given multiple times, although most dogs do not receive enough of this drug to be a concern. Cyclophosphamide can cause irritation to the bladder wall in a small percentage of dogs. If this occurs, you will see changes in urination (blood in the urine, straining to urinate, frequent urination). Please also see our handout [CHEMOTHERAPY IN PETS](#) for further information.