



BONE CANCER IN DOGS

Introduction

Approximately 85% of bone tumors in dogs are osteosarcomas (*osteo = bone, sarcoma = cancer*). Osteosarcomas are highly aggressive tumors, characterized by painful local bone destruction and distant metastasis (spread to other organs). Osteosarcoma commonly affects the **limbs** of large or giant breed dogs, but can also occur in other parts of the skeleton (skull, ribs, vertebrae, pelvis). The biological behavior, prognosis, and treatment of bone tumors depends on tumor type, primary site (location), and extent of disease (stage). Therefore, various diagnostic tests such as radiographs (X-rays), blood tests, and sometimes a biopsy are required to determine the most appropriate treatment.

Clinical signs

The signs associated with a bone tumor may be nonspecific. Tumors in the limbs often cause various degrees of lameness and pain, and a firm swelling may become evident as the tumor size increases. It is common for pain to be intermittent initially, and it may improve initially with pain medications prescribed by your veterinarian. As the degree of discomfort increases, it can cause other signs such as irritability, aggression, loss of appetite, weight loss, sleeplessness, or reluctance to exercise. Some dogs may actually present to the veterinarian as a result of a fracture, due to weakening of the affected bone. Other clinical signs may vary, depending on the primary site and involvement of underlying structures.

Diagnosis and work-up (staging)

Initial evaluation of a dog with a suspected bone tumor often includes: complete physical examination, blood tests, X-rays (of both the affected site and the lungs), a bone scan to look for other areas of bone involvement, and sometimes a biopsy. Definitive surgery may be performed without a prior biopsy if the age, breed, location and appearance of the tumor are all very suggestive of osteosarcoma. The work-up and staging are important for two reasons: it is necessary to determine the tumor type and extent of the cancer, but also provides the oncologist with information regarding the dog's general health and may identify concurrent medical, bone/joint or nerve/spinal problems, all of which may influence the treatment recommendations.

Treatment of primary bone tumors

As stated above, the treatment recommendations for bone tumors depend on multiple factors, and a complete physical examination and additional testing may be necessary to accurately determine the most appropriate treatment for an individual dog. Limb osteosarcoma commonly causes lameness and pain because of invasion and destruction of normal bone. These tumors are also highly metastatic (likely so spread to other organs), and the average dog with limb osteosarcoma will live only 4 months if treated with only surgery. Surgery usually involves amputation of the affected limb, but

limb sparing procedures may be an option in selected cases. *Amputation is almost always well tolerated by the patient – dogs with 3 legs can do virtually everything that 4-legged dogs can do.* The surgery serves two purposes; it removes the primary tumor, which is necessary for cancer control, but it also removes the source of pain, and may therefore dramatically improve quality of life. In patients where surgery is not possible, a conservative and well-tolerated form of radiation therapy can be considered. “Palliative” radiation therapy has the potential to significantly improve the degree of discomfort in approximately 75% of dogs, and the pain control lasts for an average of 2-4 months, at which time it may be repeated. This can be combined with an injectable drug called *pamidronate*, which decreases bone destruction and has been shown to can improve cancer-related bone pain in humans.

The most common cause of death is lung metastasis (spread), and amputation alone results in average survival times of only approximately 4 months. Because of this, systemic chemotherapy is recommended following surgery for dogs with appendicular osteosarcoma. Chemotherapy is unlikely to cure most dogs with osteosarcoma, but can *prolong a good quality* survival. The most commonly used drug is an injectable medication called carboplatin, which is given once every 3 weeks for a total of 4 treatments. Another drug that can be given is doxorubicin, which is less expensive than carboplatin but somewhat less effective. A combination of both drugs may be more effective, although good statistics about this are lacking. Most dogs tolerate chemotherapy well, with some dogs experiencing mild, self-limiting side effects such as depressed appetite, nausea, occasional vomiting and diarrhea for a few days. Less than 5% of dogs will experience severe side effects requiring hospitalization. If your dog's side effects are severe and compromise his/her quality of life, the dosages of these drugs can be reduced in the subsequent treatments. Please see the client handout CHEMOTHERAPY IN PETS for more detailed information about this form of treatment.

Following the completion of chemotherapy, we recommend pursuing every-other-month rechecks to insure that there is no evidence of recurrence or metastasis. The average survival time in dogs with osteosarcoma treated with surgery and chemotherapy is approximately 1 year, however 20-25% of dogs may live longer than 2 years.

Currently, the Animal Cancer Center has several **clinical trials** available for dogs with osteosarcoma whose owners elect amputation. A member of the Protocol Team can discuss these options with you.



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.