



## Canine Bone Tumors

### WHAT ARE BONE TUMORS?

Bone tumors can arise directly from bone or may occur as a metastatic lesion from an underlying cancer outside of the skeleton. The most common primary bone tumor in dogs is osteosarcoma. Other bone tumors include chondrosarcoma, fibrosarcoma, hemangiosarcoma, liposarcoma, histiocytic sarcoma, multiple myeloma, and metastatic tumors.

Osteosarcoma tumors of the appendicular skeleton (long bones of the limbs) are locally invasive and have a high rate of metastases (most commonly lungs and other bones). Osteosarcoma tumors can also occur in the axial skeleton (the bones of the skull, spinal column, pelvis, and ribs). Tumors of these locations tend to have a decreased rate of metastasis compared to those of the limbs.

It is important to differentiate osteosarcoma from other tumor types and diseases that occur within bones, such as bacterial, viral, or fungal infections. With infection, there is usually history of exposure to the infectious agent or traumatic injury to the affected region. Identification of the underlying cause is important, as this will influence the recommended therapeutic regimen.

### WHAT ARE THE CLINICAL SIGNS?

Signs are nonspecific and depend on the site affected as well as the underlying cause. For tumors located on the limb, a history of lameness, discomfort, or intermittent limping is noted. A firm swelling can also be noted. X-rays of the affected site may be recommended at the onset of signs, or should they fail to resolve with conservative management. Other nonspecific clinical signs include discomfort (panting, inability to get comfortable), favoring other limbs, aggression, loss of appetite, weight loss, reduced exercise tolerance, and whimpering/crying out.

### WHAT DIAGNOSTICS ARE PERFORMED?

In order to diagnose bone disease, a physical exam, blood tests (CBC/Chemistry), and x-rays (of both the primary site and the lungs) are recommended. The physical examination allows identification of disease and establishes a baseline for future monitoring, while blood tests can reveal changes that affect prognosis in addition to assessing a patient's overall health. X-rays evaluate for metastatic disease or establish a baseline for future monitoring. Biopsy or aspirate of the affected region of bone is frequently recommended to distinguish between a cancerous and infectious processes. An abdominal ultrasound may be recommended to assess for an underlying primary tumor or other condition that could affect outcome.

These diagnostics assist in our ability to provide you information in regards to therapy and prognosis in addition to assessing your pet's general health.

## **TREATMENT OPTIONS AVAILABLE AND PROGNOSIS:**

Treatment options will depend on the results of the diagnostics performed. In cases of infection, systemic therapy including antibiotics, antifungal, or antiviral agents may provide sufficient therapy, though painful bone lesions still require amputation or surgical removal. For metastatic tumors, the nature of the primary tumor will guide further therapy. In the case of a primary bone tumor, therapy is based on the location and extent of disease.

When determining therapy for primary bone tumors, several factors are considered including the dog's physical condition (ability to ambulate, history of arthritis), potential for spread of disease (metastasis), prognostic factors (elevation in blood markers, most notably alkaline phosphatase), and the family's goals for quality of life. For tumors of the limbs, amputation, is most frequently recommended. Though amputation is an aggressive therapy, the majority of patients respond favorably to this procedure given the severe pain associated with the presence of the primary lesion. The risk of fracture is also eliminated. Limb-sparing procedures can be pursued should the location and features of the tumor be amenable to the procedure. Risks include fracture and infection.

Stereotactic radiation is another approach for some lesions as determined by diagnostic evaluation. This modality of treatment provides pain relief without requiring amputation, though risk of fracture is possible.

Chemotherapy is recommended for many primary bone tumors, in conjunction with with both surgery and/or radiation therapy. For osteosarcoma specifically, treatment includes administration of intravenous (IV) chemotherapy every few weeks for a set number of treatments with the goal of prolonging quality of life rather than cure. Prognosis with surgery and chemotherapy is estimated at 12-14 months with excellent pain control and quality of life. Prognosis with amputation alone is estimated at 4-5 months. If no amputation is pursued, the prognosis is similar, however, without intervention the pet's quality of life is usually poor due to intractable pain.

Primary bone tumors of the axial (head, neck, spine and ribs) skeleton are usually assessed with CT scan. Complete surgical removal may not be possible. If surgery is done, and microscopic tumor cells are left behind, the tumor is likely to recur at the same site and follow-up therapy with radiation will be recommended. Average survival is dependent on site and treatment pursued. The most common cause of treatment failure is local tumor recurrence and chemotherapy may be indicated based on completeness of resection, evaluation of tumor behavior, and extent of disease.

Palliative options are available for dogs and is directed at alleviating pain and clinical signs. Options include oral medications and the administration of IV bone supportive medications called bisphosphonates. Radiation therapy may also provide pain relief and a course may be provided to this effect.

## **WHAT ARE THE SIDE EFFECTS?**

Side effects are associated with the treatment modality selected. Recovery from anesthesia and brief hospitalization are required with any surgical procedure and risks include those associated with any form of anesthesia and surgery. Radiation therapy also includes the use of anesthesia during treatments with minimal side effects from the treatments directly. There is a risk of fracture in patients who undergo limb salvage procedures (e.g. limb sparing surgery or radiation therapy). Side effects of chemotherapy are infrequent but can include temporary mild gastrointestinal upset such as vomiting or diarrhea. Decreased appetite and lethargy may also occur. Your pet will be prescribed supportive medications for nausea (should decreased appetite, or increased salivation, or drooling occur) and diarrhea for you to have on hand at home to use if necessary. It is best to be proactive with these medications and administer them as soon as signs are noted. Should you have any questions, your oncology team is available to assist.

## CONCERNS OF CHEMOTHERAPY FOR MY PET:

Chemotherapy often carries a negative impression, especially with our understanding of chemotherapy in human medicine. Our approach to chemotherapy in veterinary medicine is focused on limiting severe side effects and providing increased quality of life. Chemotherapy in human medicine is provided with intent to cure by using very high doses and increased side effects. As quality of life is imperative for our pets, doses are adjusted and your pet is monitored to limit severe side effects. Hair loss is rare except in certain breeds such as poodles. Though there is a slight risk of hospitalization in our pet population and mild gastrointestinal upset, the majority of pets tolerate therapy well. Should you have concerns during therapy, speak with your oncologist in order to develop a tailored plan for your pet.

## HOW DO I PREPARE?

We understand this is a difficult time and we are here to support you and your pet by providing the options and care necessary. Selecting a therapy is not binding and can be adjusted to you and your pet's needs. During treatment sessions, you will be provided with updates and any recommendations depending on your pet's response. Should any concerns arise, your oncology team will provide answers and help to guide you.

## NAVIGATING THROUGH MY OPTIONS:

Treatment	Prognosis- (median)	Treatment schedule	Approximate cost*
Surgery (amputation of affected limb)	4 - 6 months	Scheduled procedure.	\$3,000 - \$5,000
Surgery + chemotherapy (limb)	12 - 14 months	IV chemotherapy once every 3 weeks, starting ~2 weeks after surgery. 4 - 6 treatments total.	\$6,000 - \$8,000
Stereotactic radiation + chemotherapy (limb)	6 - 8 months	CT, Radiation treatments, follow-up IV chemotherapy once every three weeks for 4 to 6 treatments.	\$6,000 - \$8,000
Palliative-bisphosphonate/ supportive medications	2 - 4 months	IV medications provided every 4 weeks.	\$250 - \$300 per treatment
Other primary bone tumors	Pending tumor behavior and extent of disease	Pending further diagnostics including CT, surgery, chemotherapy, or radiation therapy.	Pending recommendations

Medical Oncology

go.ncsu.edu/NCStateMedicalOncology | PH 919.513.6690 | FX 919.513.6669 | Email NCStateOncology@ncsu.edu  
1052 William Moore Drive | Raleigh, NC 27607

## GETTING STARTED

Once you have determined the best therapeutic option for your pet, you may work with our oncology team to develop an appointment plan.

**Scheduling:** Appointments for patients undergoing treatments and rechecks should be scheduled in advanced. You are responsible for making this appointment with the front desk:

- Schedule your appointments at reception upon check out
- Drop offs are requested between 7:30-8:30am
- Pick ups are requested by 4:30pm

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1052 William Moore Drive | Raleigh, NC 27607