

Bone Tumors in Dogs

Types of Bone Tumors

Most primary bone tumors in dogs are malignant and the most common primary bone tumor is osteosarcoma (~85%). Osteosarcoma is a highly aggressive tumor, characterized by local invasion and destruction of the bone as well as early metastasis (spread to other organs, the most common site of metastasis being the lungs). Osteosarcoma most commonly affects the limbs (or the appendicular skeleton) of large to giant breed dogs. It can also occur in other bones such as the skull, ribs, vertebrae, and pelvis (the axial skeleton) which are more common sites in smaller dogs.

Other bone tumors include histiocytic sarcoma, chondrosarcoma, fibrosarcoma, hemangiosarcoma, liposarcoma, multiple myeloma and metastatic bone tumors. The biological behavior, prognosis and treatment of these tumors depend on the tumor type, primary site and extent of disease (stage). Therefore, various diagnostic tests such as chest radiographs (X-rays), CT scans, blood work, urinalysis and a needle aspirate or biopsy are required to determine the most appropriate treatment for each patient.

Clinical Signs

The signs associated with a bone tumor may be nonspecific and depend on the primary site. Tumors involving the limbs often cause various degrees of lameness, pain, muscle atrophy and a firm swelling may become evident as the tumor size increases. Pain can cause other problems such as irritability, aggression, loss of appetite, weight loss,



whimpering, restlessness, or reluctance to exercise. Axial osteosarcomas are often discovered as a firm, solid mass. Other clinical signs vary, depending on the tumor location and the involvement of normal adjacent tissues.

Diagnosis and Work-up (Staging)

The initial evaluation of a dog with a suspected bone tumor can include: a complete physical exam, blood work (complete blood count, serum chemistry profile; a serum chemistry profile looks at things such as liver and kidney function, protein levels, blood sugar levels and electrolytes; and urinalysis), radiographs of the primary site as well as the lungs, and an aspirate or biopsy of the lesion. In some cases, a CT scan is recommended for either metastasis screening and/or surgical planning. In dogs with osteosarcoma of a limb, a high percentage of dogs (80-90%) already have microscopic spread to the lungs even though in most cases we are not able to detect this with tests like x-rays or CT. The work-up and staging are important for two reasons. First, it is necessary to determine the tumor type and extent of the cancer to determine the appropriate treatment and prognosis. Secondly, it also provides the clinician with information regarding the dog's general health and may identify concurrent medical or musculoskeletal problems all of which may influence the treatment recommendations.

Treatment Options

As stated above, the treatment recommendations for bone tumors depend on multiple factors. A complete physical exam and work-up may be necessary to accurately determine the most appropriate treatment for an individual dog, but our goal is to always help improve your pet's quality of life. Treatment can be divided into two parts:

- pain management/treatment of the primary tumor
 - treatment to combat the possibility of metastatic disease (spread)
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Pain Management

The initial focus of treatment is pain management. Osteosarcoma causes pain because of invasion and destruction of normal bone by the tumor. There are several options for pain management depending on the location of the tumor. These include surgery (amputation for osteosarcoma of the limb), oral analgesics (pain relievers), radiation therapy and/or intravenous bisphosphonate therapy.

For osteosarcoma involving a limb, amputation is the best method for pain control. It is much easier to control post-operative pain than it is to control chronic bone pain. An amputation also eliminates the risk of a fracture at the tumor site. Fractures occur because the tumor weakens the bone to the point that it can break but the risk of a fracture is low (~20%). Most dogs will do very well with an amputation and often resume many of their normal activities - running, playing etc.- once they have healed. One should also understand that if an amputation is performed for osteosarcoma without chemotherapy, most patients develop metastatic disease (spread) and succumb to the cancer within 4-6 months, which is why we don't always recommend amputation as a sole therapy.

For dogs that are not candidates for an amputation or situations in which a caretaker isn't interested in amputation, we have several options for pain management that can be used singly or in combination. There is no "one size fits all" when it

comes to pain management and we may need to try several combinations until we find what works best for a particular dog.

Oral Analgesics include non-steroidal anti-inflammatory drugs (NSAIDS) (or aspirin-like drugs), steroids and narcotics. It is common to combine a NSAID with a pain medication (ex. Gabapentin). There are also drugs that can work differently that can be added to these pain protocols (such as amantadine).

Palliative Radiation Therapy (PRT) involves the use of several large doses of radiation administered once a week, for 3-4 doses. PRT appears to be the best option for pain management if surgery (amputation) is not pursued. The goal of this form of radiation is to improve/maintain the patient's quality of life with minimal negative impact (minimal side effects). Approximately 70% of dogs experience pain relief with PRT which lasts an average of 4 months. It may be possible to repeat a course of PRT, depending on the dog, though the duration of the response is usually shorter than the original response. PRT for bone tumors (appendicular) is for pain management and is not a treatment for the primary tumor. In most patients the tumor continues to progress even though the patient is more comfortable, and fracture is still a risk.

Bisphosphonates: Bisphosphonates are a class of drugs that are meant to slow or prevent bone breakdown as well as increase bone production. This class of drugs is used frequently in women to prevent osteoporosis (ie. Boniva or Fosamax). Several of the drugs have also been used to help control pain from bone destruction. The most commonly used drug is zoledronate which is administered intravenously once every 4 weeks. Zoledronate is administered as a 15-minute infusion. Initially we plan 2-3 treatments and then determine if there has been an improvement. If there has been an improvement, this drug can be repeated for as long as there is a response, and the patient tolerates the drug. Side effects of this drug are rare although we do monitor kidney function prior to each treatment due to the low risk of toxicity.

Other pain management agents may include acupuncture and local nerve blocks.

Chemotherapy

The most common cause of death in dogs with appendicular osteosarcoma, especially those undergoing an amputation, is lung metastasis (spread to the lung). Because of this, systemic chemotherapy is recommended as a follow-up to surgery for dogs with appendicular osteosarcoma and some patients with axial osteosarcoma. Chemotherapy is not likely to cure most dogs with osteosarcoma but can result in a median survival time of 10-12 months with 20% of patients still alive at 2 years. Survival time for dogs treated with an amputation alone is about four months. We currently recommend the chemotherapy drug Carboplatin at three-week intervals for 6 cycles. Most dogs tolerate this chemotherapy well with only mild, self-limiting side effects such as decreased appetite, nausea, occasional vomiting, and diarrhea for a few days. Roughly 10% of dogs will experience severe, life-threatening side effects requiring hospitalization and supportive care. Fortunately, most dogs do not experience side effects and if they do, the side effects are mild and treated with oral medications. If your dog's side effects are severe and compromise his or her quality of life, the dosage will be reduced in the subsequent treatments.