

Bone Tumors in Dogs
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Tumor types

Most primary bone tumors in dogs are malignant, and approximately 85% consist of osteosarcomas. Osteosarcomas are highly aggressive tumors, characterized by local invasion/destruction and distant metastasis (spread to other organs such as the lungs). Osteosarcoma commonly affects the appendicular skeleton (limbs) of large to giant breed dogs, but can also occur in the axial skeleton (skull, ribs, vertebrae, pelvis), which is a more common primary site in smaller dogs. Other, less common bone tumors include chondrosarcoma, fibrosarcoma, hemangiosarcoma, liposarcoma, histiocytic sarcoma, multiple myeloma, and metastatic bone tumors. The biological behavior, prognosis, and treatment of these tumors depend on the tumor type, primary site (location), and extent of disease (stage). Therefore, various diagnostic tests such as radiographs (X-rays), blood work, and a biopsy are required to determine the most appropriate treatment.

Clinical signs

The signs associated with a bone tumor may be nonspecific and depend on the primary site. Tumors in the limbs often cause various degrees of lameness and pain, and a firm swelling may become evident as the tumor size increases. The pain can cause other problems such as irritability, aggression, loss of appetite, weight loss, whimpering, crying, sleeplessness, and reluctance to exercise. Tumors in non-weight-bearing bones may initially appear as a solid, firm mass. 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 exam, blood tests, radiographs (of both the primary site and the lungs), and a biopsy. The biopsy can be incisional or excisional. An incisional biopsy is performed for diagnosis only. A small sample of the tumor is removed to determine the specific tumor type. An excisional biopsy involves removing the entire tumor, both for diagnostic as well as therapeutic purposes. 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 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 of primary bone tumors

As stated above, the treatment recommendations for bone tumors depend on multiple factors, and a complete physical exam and work-up may be necessary to accurately determine the most appropriate treatment for each individual dog.

Since osteosarcoma is by far the most common tumor type, this treatment discussion will focus on osteosarcoma. We often classify osteosarcomas as appendicular (the long bones of the limbs) or axial (the flat bones of the skull, spinal column, pelvis, and ribs), because the location of the tumor may have

implications both for the surgical approach as well as the tumor's biological behavior, and therefore require different follow-up treatments.

Appendicular osteosarcoma commonly causes lameness and pain because of invasion and destruction of normal bone and periosteum (sensitive structures surrounding bone). These tumors are also highly metastatic (likely to spread to other organs), and the average dog with appendicular osteosarcoma will live 4-6 months if treated with surgery alone. Surgery at VHUP usually involves amputation of the affected limb, although limb-sparing procedures may be an option in selected cases when amputation is not an option. 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 the quality of life of the patient.

The most common cause of death from osteosarcoma is lung metastasis. Because of this, systemic chemotherapy is recommended as follow-up therapy for dogs with appendicular osteosarcoma. Chemotherapy is not likely to cure most dogs with osteosarcoma, but can prolong their good-quality survival time. The average survival in dogs with osteosarcoma treated with surgery and chemotherapy is approximately 1 year.

Axial osteosarcomas are often diagnosed as a firm, solid mass. Other clinical signs vary, depending on the tumor location and the involvement of normal adjacent tissues. Because of the location of most axial osteosarcomas, a complete surgical removal may not be possible. If microscopic tumor cells are left behind, the tumor is likely to recur at the same site. Average survival is dependent on site and treatment pursued. The most common cause of treatment failure is local tumor recurrence. Follow-up treatment is focused on improving local tumor control, and radiation therapy is a reasonable choice. There is currently limited information regarding the effect of adjuvant radiation therapy in dogs with axial osteosarcomas. The metastatic potential of these osteosarcomas varies depending on the location, and chemotherapy may be indicated in some cases as well.

The above are general treatment guidelines for dogs with osteosarcoma. In addition, palliative measures might be suggested for dogs that are not candidates for any of these options for various reasons. A palliative treatment is given to alleviate pain and symptoms from the tumor, and may involve the use of different types of pain medication and/or a few high doses of radiation therapy. Such treatments may help control the pain in dogs with osteosarcoma and therefore provide the client and pet with additional good quality time together.