

Bone Cancer: Osteosarcoma

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Though osteosarcoma was presented in the prior section as an oropharyngeal tumor, it is also the most common primary bone tumor occurring in dogs. These tumors develop most frequently in the long bones of limbs and less commonly in the bones of the spinal column or skull. These tumors are locally invasive, destroying normal bone as they progress, and frequently metastasize to the lungs thereby complicating therapeutic management of the disease. Giant breeds have a greater risk for developing osteosarcomas, and males have a slightly higher risk than females for this form of cancer.

Average Age of Onset

Cancerous lesions of the bone present most commonly between 2-8 years of age, with 7 years being the average age for presentation.

Cause

Mutations in the gene encoding a tumor suppressor protein reportedly occur in close association with and are probably predisposing factors for development of osteosarcoma in dogs. Other risk factors are associated with increasing age and increasing height. Neutered dogs appear to have an approximate two-fold increase in risk to developing osteosarcoma. Additionally, one report has found evidence linking bone infarction (loss of blood supply resulting in dead

tissue) occurring after surgery for total hip replacement in dogs with subsequent development of osteosarcoma at the site of the infarction.

Symptoms

Progressive lameness often leads to the finding of a painful swelling at the site of the bone tumor. Occasionally, a sudden fracture of the effected bone may be the presenting condition, but this occurs less frequently. Dogs are usually free of other symptoms. Only when the tumor has progressed to a metastatic stage may other symptoms like weight loss, enlarged lymph nodes, or difficulty breathing become evident.

Diagnosis

Many conditions may cause lameness and swelling also associated with osteosarcoma. Additionally, the possibility of other primary bone tumors or metastasis of other tumor-types to the bone must be ruled out prior to making a diagnosis of primary osteosarcoma. Biopsy of bone tumors by surgical sampling is often difficult because of complications that may arise following surgery. The use of a bone marrow biopsy needle to resection a small portion of the tumor site has proven minimally invasive while providing sufficient cellular material to provide accurate diagnosis. Once a diagnosis of osteosarcoma is determined, presence of metastasis to the lungs is confirmed by chest x-ray. Bone scans (nuclear scintigraphy) may be helpful for locating sites of other bone lesions caused by metastases, however, fewer than 10% of dogs usually show detectable evidence of secondary bone

metastases by either of these methods. Recent evidence suggests that dogs with osteogenic tumors that are more vascularized, as determined during microscopic examination, have a greater likelihood of having lung metastases than those having tumors with fewer blood vessels. This observation may serve as a prognostic indicator for using more aggressive therapies despite the absence of detectable secondary metastases.

Treatment

Up until recently, amputation of the tumor-bearing limb followed by Cisplatin chemotherapy was the most effective therapy. It has been found, however, that limb sparing surgery (in which the tumor is removed and the bone is reconstructed at the site of excision) followed by Cisplatin treatment is just as effective in selected cases while providing excellent cosmetic and functional results. Radiation therapy may be used before or after surgery or in cases of inoperable or incompletely removed bone tumors, and is often used to provide pain relief from secondary bone tumors associated with metastases. Surgical removal of lobes of the lungs harboring metastatic lesions has been indicated as increasing survival in some dogs in which the primary bone tumor has been successfully treated by surgery.

Prognosis

Without treatment, dogs diagnosed with osteosarcoma will succumb to their cancer in about 1-2 months. Worsening pain at the site of the bone tumor usually results in the dog being

euthanized prior to this period of time, however. Amputation alone provides short-term benefit with anticipated average survival of about 5 months and about 10% of dogs surviving up to one year. This procedure also increases quality-of-life for the dog by alleviating the primary source of the pain. Because metastasis is the main limitation to effective long-term survival for osteosarcoma, combining Cisplatin therapy with amputation has been found to increase 1 year survival to 50%. Similarly, treatment with Doxorubicin or Carboplatin increases average duration of survival though to a lesser extent than Cisplatin therapy. Limb sparing surgery in which the area at the site of the tumor is removed and reconstructed is most successful in dogs that have tumors involving less than 50% of the effected bone. In such instances, limb sparing surgery combined with Cisplatin therapy is just as effective in terms of survival rates as complete amputation combined with Cisplatin therapy. Radiation therapy combined with Cisplatin therapy to treat inoperable or incompletely resected tumors provides pain relief for an average of about 2-3 months and in some cases up to 6 months or longer.

Prevention

Size, in regard to height more so than weight, appears to be one of the predisposing factors for development of osteosarcoma. Additionally, evidence suggests that bone trauma may be another factor. It is possible that stimulation of genetically (either inherited or acquired) abnormal bone

cells during rapid growth or incidences of bone repair may induce the development of osteosarcomas.

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