

Southern California Veterinary Specialty Hospital

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OSTEOSARCOMAS

Osteosarcomas are the most common type of bone tumor in dogs. Almost 90% of dogs with bone cancer have this type. This cancer most often affects large middle-aged dogs over 40 pounds, but it can affect any size, age and breed. The most common sites for this cancer to occur are the wrist, shoulder, knee and hip. Occasionally, it may invade the bones of the skull, ribs or spine. The cause of osteosarcoma is unknown, but genetics and microscopic injury to the ends of bones during growth may play a role.

Behavior

Osteosarcoma begins in the bone but spreads very early in the course of the disease. This spread (metastasis) is thought to occur before the initial cancer in the bone is detected. In 5-10% of dogs with osteosarcoma, lung metastases will be visible on a chest x-ray when the dog is first diagnosed with bone cancer. For about 90% of patients, these metastases are present but are too small to be seen on the initial x-ray. Spread in these cases is called "*micrometastasis*". This means that with time, many dogs will develop visible spread on x-rays. This spread will ultimately lead to death. The lungs are the most common place for osteosarcoma to spread, but this cancer has also been reported to spread to other bones, skin and other organs.

Osteosarcoma is a very aggressive form of cancer in dogs and at this time, there is no cure. However, treatment may give dogs months to years of quality life.

Diagnosis and Staging

The first sign of bone cancer is a persistent or variable lameness due to the pain of the cancer. As the cancer grows, a swelling at the tumor site may develop. In some dogs, the leg may fracture at the cancer site.

X-rays are the first step in identifying bone cancer. Bone cancer destroys bone and makes new, abnormal bone and this will show up on x-rays. X-rays can suggest a diagnosis based on the appearance of the lesion. Occasionally other diseases, such as bacterial or fungal infections, bone injuries and other bone tumors, may mimic the appearance of osteosarcoma on x-rays. X-rays of the chest are also recommended to search for potential metastases.

A fine needle aspirate successfully diagnoses bone cancer in approximately 70% of dogs. This is a relatively easy, minimally invasive test and results are often available in 24-48 hours. A biopsy is the best way to definitively diagnose bone cancer. There are two basic ways to obtain this biopsy.

- 1) Bone biopsy: This is a relatively quick and simple surgical procedure. An incision is made over the affected bone and a small core of bone is taken using a specialized biopsy needle. This procedure is done if there is real concern about other diseases (infectious),

if the tumor is an unusual location for osteosarcoma, or if the decision to treat would be influenced by the diagnosis. Approximately 10-20% of biopsies done this way may be non-diagnostic. Disadvantages of this procedure include the pain of this procedure and a slightly increased risk for fracture to the leg at the biopsy site. Also, the results may not be available for up to 7-10 days.

- 2) **Surgical excision:** Removal of the entire piece of abnormal bone, generally done by amputation, is the most reliable diagnostic method because a larger piece of bone can be submitted to the pathologist. In cases where the x-ray results are sufficient to make a presumptive diagnosis, when financial constraints preclude a bone biopsy, or when destruction of the bone is so advanced that the entire bone must be removed regardless of the diagnosis, amputation may be done without a pre-operative biopsy. This method of diagnosis also serves as treatment for osteosarcoma.

A bone scan is another test that will be recommended for some dogs. This is a sensitive, non-invasive test that can detect spread to other bones. This test is recommended on an individual basis.

A blood panel and urinalysis are done to evaluate for concurrent health issues and to ensure your pet is a good candidate for therapy. Alkaline phosphatase (ALP) is a result evaluated on the blood panel and may be prognostic for some patients with osteosarcoma (patient with increased ALP may have shorter survival times).

Treatment and Prognosis

Treatment for osteosarcoma should address the issues of pain relief and the risk of metastasis. There are several treatment options depending on the location and extent of the tumor. Remember that the goal of treatment is to allow your pet to enjoy a good, happy, pain-free quality of life.

1) Surgery +/- chemotherapy

- a) Amputation and chemotherapy: Currently, this is the standard treatment for dogs with osteosarcoma. Amputation removes the primary cancer and also relieves the pain. Greater than 90% of dogs will function at a normal level after amputation. Most dogs are up and walking within days of the surgery and three-legged dogs can enjoy the same activities as four-legged dogs! Chemotherapy is given after amputation to treat the micrometastases. Several drugs are effective at decreasing the rate of spread and your dog would receive 4-6 treatments depending on the drugs given. The majority of dogs tolerate the drugs very well and have minimal to no side effects.

Three drugs are effective against osteosarcoma in dogs: **Cisplatin, Carboplatin** and **Adriamycin**. Cisplatin is the traditional drug used. In some patients a single course of Cisplatin or Adriamycin is recommended; others may receive a combination of these drugs.

- b) Limb sparing surgery and chemotherapy: Limb sparing surgery involves removing only the affected piece of bone and replacing it with a bone graft from a cadaver dog. This can only be done for tumors involving the wrist and certain requirements are needed. The main complication is a high risk of infection and

dogs need to be on antibiotic therapy for an extended period of time. Although this is a more involved procedure, this treatment is a good alternative for dogs that can't otherwise handle an amputation. This includes dogs with other orthopedic or neurological problems and obese dogs. This surgery is also followed with chemotherapy.

- c) Amputation alone: This therapy provides pain relief and gives the patient better quality of life. However, most dogs will die from metastatic disease within several months.

2) Radiation therapy, Pamidronate +/- Chemotherapy

- a) Palliative radiation: Radiation therapy is given once a day for 5 days. The goal of this treatment is to control the local pain. Approximately 75-80% of dogs achieve pain control for 4-6 months. The radiation is well-tolerated with minimal side effects, although it does slightly increase the risk of fracture in bone tumor patients.
- b) A new area of study is bisphosphonate therapy, using a drug called *pamidronate*. There is evidence that this drug may help relieve bone pain and also helps remodel diseased bone, making the bone more stable. When used alone, approximately 30% of dogs achieve pain relief for about 4 months. When used in combination with palliative radiation, it can decrease this risk of fracture and offer longer pain control. Pamidronate is well-tolerated and given as a 2 hour IV drip once a month. Multiple treatments are usually needed to maintain pain control.
- c) Chemotherapy: Combining palliative radiation and pamidronate may offer significant pain control lasting many months. Chemotherapy is then added to the protocol to slow the progression of metastatic disease. Adriamycin is the drug generally administered with a total of 5 doses given every 3 weeks.

3) Analgesic therapy alone

Pain medications can be given in an attempt to make the dogs more comfortable. However, most dogs will not receive significant pain relief that lasts more than a few days or weeks. If a more definitive therapy is not done, euthanasia is the most human way to eliminate the pain.

Option	Cause of Death	Average Survival	Comments
Amputation + Chemotherapy	Metastasis	10-14 months	25% are alive at 2 yrs. 10% are alive at 3 yrs.
Limb Sparing + Chemotherapy	Metastasis	10-14 months	Higher complication rate than amputation
Amputation alone	Metastasis	4-6 months	Eliminates pain
Palliative Radiation Therapy	Local failure (pain) or metastasis	4-6 months	Decreases pain
Analgesic Therapy	Local failure (pain)	1 month	Limited value
Pamidronate	Local failure (pain) or metastasis	4 months	30% pain control
Palliative Radiation Therapy + Pamidronate + Chemotherapy	Local failure (pain) or metastasis	Unknown, expect 8-12 months	80% pain control

