



The Pet Oncologist

Osteosarcoma in Dogs

Osteosarcoma is the most common aggressive primary bone cancer in dogs. This cancer typically occurs in the leg. However, it can affect any bone in the body. Osteosarcoma primarily affects large dog breeds in middle-aged to older dogs — median (average) age of 7 years. However, dogs as young as 6-months of age can be affected. The cause of osteosarcoma is generally unknown. However, evidence in dogs supports breed-associated inheritance of osteosarcoma. Osteosarcoma is a serious cancer; but with treatment, the vast majority of dogs can be significantly helped.

Osteosarcoma behaves in a very predictable fashion. Cancer in the leg is very painful because swelling, fractures and bleeding cause pressure on the sensitive nerve endings in the surface of the affected bone. Occasionally, the fractures can be more severe, causing an actual break in the leg, which cannot heal (called a pathologic fracture). Osteosarcoma almost always spreads (metastasis) to the lungs before diagnosis. Although at the time of diagnosis, cancer in the lungs are usually microscopic and not visualised on chest x-rays. In treating osteosarcoma, we must address both cancers in the leg and the lungs.

Diagnosis is usually confirmed with sampling of the bone lesion by either cytology (fine needle aspirate samples) or biopsy (tissue sample), chest x-rays, blood and urine tests. The results of these tests will allow veterinarians to develop individualised treatment recommendations for your dog.

For the majority of dogs, amputation is the best treatment for cancer in the leg. Amputation is performed primarily to alleviate the pain produced by cancer, and also to prevent the leg from being broken. Although most dog owners initially do not like the idea of amputation, dogs (even large and giant breed dogs) respond to the surgery exceptionally well. Dogs can function well on three legs: they can go on long walks, play with family members and other dogs, swim and go up and downstairs. Most dog owners are pleasantly surprised to see how well their dogs adjust to the surgery. 88% of dogs have the same or near same quality of life after amputation, and 73% of dogs return to their pre-amputation activity levels after surgery. Most dogs readily compensate, although osteoarthritis may progress more rapidly in three-legged dogs, rarely does this result in a clinical problem. The pain associated with the procedure is minimal, and most dogs are up and walking the next day. Because dogs have no concept of the appearance, amputation is not associated with emotional or psychological difficulties for dogs. It is one of the most common and rewarding surgeries performed by veterinarians.

There is a website created for pet owners that have had amputation performed in their pets. This website may assist pet owners in deciding on whether amputation is an option for their pet. <http://tripawds.com/>. However, there are also other non-useful information on this website that veterinarians do not advocate. The videos and blogs on pet amputees may be helpful.

Life expectancy following surgery is limited because the cancers in the lungs (metastasis) continue to grow. On average, dogs live 4 to 5 months after surgery, and approximately 10% of dogs live over a year. Nevertheless, amputation is recommended as the best method of relieving pain. Pain relief allows for a consistent improvement in the patient's quality of life.

Because amputation does not prevent the growth of the metastasis, a therapy that can reach the lungs and other body sites are required to prevent or delay the growth of these cancers. The most important advance in the treatment of osteosarcoma is chemotherapy following surgery can slow the growth of the metastasis, dramatically improve life expectancy and in some cases result in a cure.

Three chemotherapeutic medications, cisplatin, carboplatin and doxorubicin, are effective in treating dogs with osteosarcoma. On average (50% of dogs) will live 10 to 12 months when either of these drugs and some dogs live well beyond a year. For dogs that are otherwise healthy carboplatin is the chemotherapy of choice. Carboplatin is usually administered every three weeks for approximately 4 to 6 treatments. **For dogs completing this protocol, the chances of living beyond two years after amputation are about 20%.**

It is essential to understand the difference between chemotherapy treatment in human and veterinary medicine. In human medicine, the main objective of chemotherapy is to eliminate all cancer cells to try to obtain a cure. Usually, it is administered aggressively and has more chances of developing side effects. Curing cancer in veterinary medicine is desirable (and feasible for some cancers). However, due to the less aggressive approach (for example, lower dosages), pets usually tolerate chemotherapy far better than humans. The primary goals of chemotherapy are to minimise discomfort associated with cancer growth or slow the progression of cancer while striving to maintain or improve the pet's quality of life.

Pets experience fewer and less severe side effects than humans. Approximately 80% to 90% of dogs that receive chemotherapy experience no side effects. About 10% to 20% of dogs experience a chemotherapy side effect (such as lethargy, nausea, inappetence, vomiting or diarrhoea), which can often be managed with supportive home medications. Approximately 5% of dogs experience a chemotherapy side effect that requires hospitalisation. For example, when the white cell counts drop to a critically low value and make the dog feel unwell, sepsis. Less than 1% of chemotherapy side effects unexpectedly results in death.

If you decide to proceed with chemotherapy in your dog, any side effect he or she experiences is manageable. Please notify your veterinarian to make changes in future treatments to try to avoid these side effects from recurring and impacting your dog's quality of life.

Other alternatives to amputation include limb-sparing surgery, stereotactic radiation therapy, palliative conventional radiation therapy, samarium, bisphosphonates, and pain relief medications.

Although most dogs function well with amputation, there are some cases where **limb-sparing surgery** is preferable over amputation. For example, dogs with severe pre-existing orthopedic or neurologic disease, or pet owners who will not permit amputation. Limb-sparing surgery is a complicated surgery that should be performed with a specialist surgeon experienced in this procedure. Although limb function has been fair to good in approximately 80% of dogs, owners will require commitment because complications can arise in any phase of treatment. Moreover, most dogs will require frequent revisits and adjunct therapy. Occasionally, complications may result in amputation of the affected limb. Survival has not been adversely affected by performing a limb-sparing surgery compared to amputation. Likewise, limb-sparing surgery followed by adjunct chemotherapy has similar survival times to dogs treated with amputation followed by adjunct chemotherapy.

Stereotactic radiation therapy is a form of local treatment applied to the affected leg. It involves the delivery of high doses of radiation therapy to try to kill the cancer cells. It does not prevent the growth of metastasis nor the possibility of the bone in the leg from breaking. Treatment typically involves daily treatment over three days, followed by chemotherapy to slow down the onset of metastasis. The average reported survival times after stereotactic radiation therapy, and chemotherapy is approximately 9.6 months to 1.1 years. Stereotactic radiation therapy is only available in Sydney at the Animal Referral Hospital (Sydney and Brisbane) <http://arhvets.com.au/homebush/> and Small Animal Specialist Hospital (Sydney) <https://sashvets.com>.

Palliative conventional radiation therapy is a less effective alternative for dogs that cannot be treated by amputation, limb-sparing surgery, or stereotactic radiation therapy. It is also a form of local treatment applied to the affected leg. Treatment is administered every one to four weeks to try to improve limb function and alleviate pain. More than 70% of dogs will have improved limb function and pain relief for approximately 2 to 3 months. However, it does not prevent metastasis nor the possibility of the bone in the leg from breaking. Palliative conventional radiation therapy is available at Brisbane Veterinary Specialist Centre (Brisbane) www.bvsc.com.au, Animal Referral Hospital (Sydney) <http://arhvets.com.au/homebush/>, Small Animal Specialist Hospital (Sydney) <https://sashvets.com>, and Southpaws (Melbourne) <https://www.southpaws.com.au>.

Samarium is a radioactive isotope administered as an injection to the vein that concentrates in areas of high bone turnover (i.e. bone cancer). It may help alleviate pain and improvements seen within two weeks. The side effects and durations are similar to radiation therapy. This treatment is generally well tolerated. However, dogs will require isolation (while the radioactivity is cleared from the body) for 3-5 days after treatment. Thus, it may not be suitable for old arthritic dogs or dogs that have other medical problems requiring regular monitoring or medications. This option is available at Gladesville Veterinary Hospital (Sydney) www.gladesvillevet.com.au.

Bisphosphonates are medications that can be given orally at home (alendronate), or into the vein as a short infusion in hospital (zoledronate or pamidronate). Bisphosphonates bind to bone to inhibit bone breakdown. Bisphosphonates may help alleviate bone pain and may reduce the risk of bone fractures.

Pain relief medications may be given by itself. However (despite the use of many different forms of pain relief medications), most dogs will, unfortunately, become refractory to pain relief medications within a few months.