

## Radiation Therapy – Limb Osteosarcoma

Osteosarcoma (OSA) is by far and away the most common primary bone cancer of dogs (and people). It is an aggressive cancer that destroys normal bone, causing clinical signs of lameness and pain and characteristic changes seen on x-rays (radiographs). It can also spread rapidly to other parts of the body, most commonly to the lungs or other bones. Osteosarcoma can affect any bone, but most commonly occurs in the leg bones: the radius (near the wrist joint), the humerus (near the shoulder joint) and the tibia or femur in the back leg, often near the knee joint.

The diagnosis of bone tumors requires a needle or biopsy sample of the bone. If a sample is not obtained, OSA can be the most likely differential based on tumor location, age and breed of the patient, however, other bone tumors cannot be ruled out. Other bone tumor types account for 2% to 15% of bone tumors, and include chondrosarcoma, fibrosarcoma, hemangiosarcoma and round cell tumors. These tumors have differing prognoses. Please consult your oncologist for specific tumor type information if your pet has a bone tumor other than OSA.

The current standard of care for dogs with OSA is amputation of the affected limb followed by 4-6 cycles of chemotherapy. The majority of dogs, even the large and giant breeds, do extremely well after amputation surgery. The median survival time for dogs with this treatment is 10-12 months.

Some dogs may not be good candidates for amputation due to concurrent orthopedic or neurologic disease. Surgical limb-sparing surgery is a treatment option for dogs that have OSA in selected sites and situations. In this surgery, the affected bone is removed then replaced by either a bone graft from a donor or a metal spacer. Dogs generally function well with this treatment, but there can be a high complication rate with implant loosening/breakage, infection, or local tumor recurrence in the leg.

Radiation has become an attractive option for the treatment of OSA in dogs because it is non-invasive and has no recovery time compared to surgery. Some radiation clinics offer a form of definitive therapy called stereotactic body radiotherapy (SBRT). SBRT combined with chemotherapy is a curative-intent treatment that precisely delivers a high dose of radiation to the affected bone to kill the cancer cells. This therapy can provide significant pain relief in our patients and prevent progression of the primary tumor. In combination with chemotherapy, we are seeing survival times of about 9 months in patients treated with SBRT in combination with chemotherapy.

However, not every dog is a good candidate for SBRT. Some dogs with very lytic, or destructive, bone lesions will have an unacceptably high risk of fracture following SBRT and this therapy would not be recommended. The radiologist and radiation oncologist assess the integrity of the bone on a CT scan prior to therapy to assess this risk. Even “good” candidates for SBRT on x-rays, and dogs without ANY radiation therapy, have a 30-40% risk of breaking the bone with the tumor. If a fracture occurs, amputation is recommended at that time. Surgical stabilization of fractures associated with tumors has been disappointing, with a high rate of implant-associated infections and implant failure.

If it is determined that SBRT is not an option, is not available, or is not the choice of the pet owner, there are palliative radiation options. The most common protocol is a moderate amount of radiation, given in 2 doses (or fractions) on consecutive days. Radiographs of the bone lesion are required for planning, and chest radiographs and recent blood work are required prior to anesthesia. A publication out of Cornell University looked at 58 dogs that received this protocol. Over 90% of the patients responded positively to the radiation protocol, and the median time it took for the patient to experience pain relief was 2 days

(occasionally up to a couple weeks) after the treatment. Duration of pain relief was about 2 months. Others have reported seeing 3-4 months of pain relief provided by palliative radiation. If your pet has an initial positive, durable response, the protocol can be repeated in the future at the discretion of your radiation oncologist.

Because your pet may feel better following radiation, he or she may use the affected limb more, which can increase the risk of fracture. Exercise restriction may be recommended based on the appearance of the bone lesion and the clinical presentation of your pet. Bone tumor locations other than the limbs, such as the pelvis, rib, or spine, may be treated with SBRT or an alternative palliative radiation protocol, such as a once-a-week dose of radiation given for 4-6 weeks in a row. Consult with your radiation oncologist about the optimal radiation protocol for your pet.

To help preserve bone strength and additional pain relief, the radiation protocol can be supplemented with bisphosphonate therapy. Pamidronate and zoledronate are the two bisphosphonates most often used in veterinary medicine. This is an injection into the vein that takes about 20 minutes (with zoledronate). These medications work by slowing down the destruction of the bone, and can help with pain relief in about 30-50% of patients.

We respectfully request and appreciate regular follow up information from clients and referring veterinarians on patients treated with palliative radiation, including how well your dog is using their leg, any complications associated with therapy, development and date of any secondary cancer in the lungs or other bones, and date of eventual death from any cause. All of this information helps us to provide the best possible standard of care for our patients.

If you have any questions regarding radiation and whether it is an appropriate treatment option for your dog, please do not hesitate to discuss these with your oncology clinician. They will also be able to put you in direct contact with the radiation oncologist or other clinician researchers if appropriate.

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*Veterinary Specialty Center is guided by the belief that companion animals deserve state-of-the-art medical care in a kind and comforting environment. The courage of our patients, the loyalty of their human families, and the devotion of our referral veterinarians inspire our vision. It is sustained by the contributions of our compassionate, knowledgeable and dedicated staff and built upon a tradition of providing unsurpassed healthcare for animals.*

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