

## Bone and Joint Tumors in Dogs

These notes are provided to help you understand the diagnosis or possible diagnosis of cancer in your pet. For general information on cancer in pets ask for our handout "What is Cancer". Your veterinarian may suggest certain tests to help confirm or eliminated diagnosis, and to help assess treatment options and likely outcomes. Because individual situations and responses vary, and because cancers often behave unpredictably, science can only give us a guide. However, information and understanding for tumors in animals is improving all the time.

We understand that this can be a very worrying time. We apologize for the need to use some technical language. If you do not understand anything please do not hesitate to ask us.

### ***What are these tumors?***

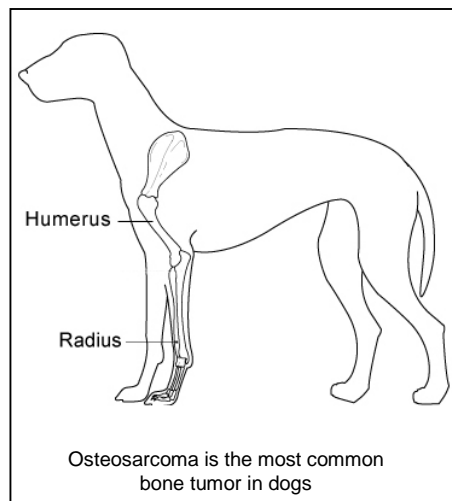
Non-cancerous bone tumors are rare and mainly due to abnormal development. They include **bone cysts** and single or multiple lumps of bone in abnormal places (**exostoses**). **Fibrous dysplasia** is another developmental condition that causes bone swelling around areas of bone destruction. '**Cranio-mandibular osteoarthropathy**' of some terriers is a disease of the head bones.

'Benign' (non-spreading, local) tumors are also rare and of several types. '**Ossifying fibroma**' (**osteofibroma**, **fibrous osteoma**) is an expansile lesion in the jaw that destroys existing bone structure. **Osteomas** and **osteochondromas** are benign tumors in immature animals. **Chondromas** are also benign but some become malignant (**chondrosarcomas**) and infiltrate locally.

90% of bone cancers are malignant (capable of spreading to other body sites). **Osteosarcoma** is by far the most common, particularly in large dogs. In these animals, it is usually in a limb (appendicular skeleton). They often spread to other parts of the body (metastasize).

Rare types of malignant bone cancers include the locally aggressive 'giant cell tumor of bone' derived from bone marrow cells, and 'multilobular tumor of bone' (multilobular osteoma/chondroma of canine skull) which is slow-growing. Joint tumors (synovial sarcomas) are rare. Spread (metastases) to bones of cancers from the mammary glands, liver, lung or prostate are relatively common.

### ***What do we know about the cause?***



The reason why a particular pet may develop this, or any cancer, is not straightforward. Cancer is often seemingly the culmination of a series of circumstances that come together for the unfortunate individual.

Non-cancerous bone tumors such as cysts and exostoses are due to abnormal development. Craniomandibular osteoarthropathy has a genetic basis.

We do not know the precise cause of malignant cancers of bones in dogs but abnormal bone cell growth and unusual hormone stimulation may be implicated. A history of previous fracture at the site of osteosarcoma is also not unusual. Excessive proliferation of cells to heal the fracture gives greater opportunity for mutation to a cancerous form. Body size and sex are also important in the development of bone cancers in dogs so genetic factors also have a role.

### ***Why has my animal developed this cancer?***

Developing cancer is often the result of chance misfortune. Some animals have a greater tendency (genetic susceptibility) to cancer. Some breeds have far more bone cancers than other breeds.

### ***Are these common tumors?***

All the non-cancerous and benign bone tumors are rare.

Malignant bone cancer is not common but one survey found an incidence of 7.9 per 100,000 dogs. Osteosarcoma accounts for 80% of all canine bone tumors and chondrosarcoma for another 10%. The median age of affected dogs is seven years but tumors can occur in young dogs. The youngest recorded case is a 3-month-old dog with a mandibular tumor. Rib tumors are common at an early age.

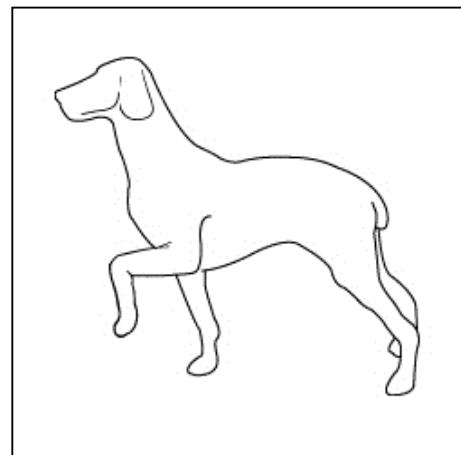
Large, particularly giant breed, dogs are most frequently affected and 75% of tumors are in the forelimbs, particularly radius and humerus bones. The most commonly afflicted breeds include Great Danes, German Shepherds, Rottweilers, Saint Bernards, Boxers and Irish Setters. Most cases are male dogs. In small dogs, most bone tumors are axial (bones other than in the limbs) and less than 50% of these are osteosarcoma. Large dogs with axial tumors are usually female.

Chondrosarcomas are the second most common primary tumor of bone and account for 5 to 10% of all bone tumors in dogs. The average affected dog is 8 years old (range, 1 to 15 years). The inside of the nose is the most common site but they also occur in the ribs and other bones.

Multilobular tumors of bone are uncommon but are usually in the skull. The average age of affected dogs is 7 years with a range of one to 12 years. Affected breeds are usually medium to large size and are rarely giant breeds. Giant cell tumors are very rare. Joint (synovial) tumors usually affect the stifle and elbow of large breeds such as the Rottweiler. They are rare and difficult to diagnose with certainty unless specialized techniques are available.

### ***How will these cancers affect my pet?***

Non-cancerous and benign bone tumors are usually hard swellings. Clinical signs vary with the site. Cysts, fibrous dysplasia and ossifying fibroma, cause bone destruction but there is swelling as well.



Craniomandibular osteoarthropathy causes pain and fever and may prevent the affected dog from eating.

Lameness is almost always the first sign of malignant limb bone cancer. Pain and swelling follow and the limb may become increasingly painful and hot. As the swelling increases and muscles atrophy, pain decreases but the bones may fracture. Tumors in the backbone cause pain. Those in the ribs and head often cause less pain as they are slower growing. In some sites such as the nose, there may be signs due to local blockage.

The growing cancer causes weight loss and increased blood calcium, which damages the kidneys. Approximately 90% of dogs will die of metastasis within one year. Lung metastases induce thickening of the lower limb bones (hypertrophic pulmonary osteoarthropathy or HPOA) in up to a quarter of dogs.

### ***How are these cancers diagnosed?***

In large breed dogs, lameness associated with certain sites and typical clinical and X-ray (radiography) patterns can be assumed to be cancer until proven otherwise. Sometimes, the accurate diagnosis also requires microscopic examination of the bone. The samples for this are usually small parts of the cancer (biopsy) taken by special needle or surgical biopsy. These are submitted for histopathology. This is the microscopic examination of specially prepared and stained tissue sections and is done at a specialized laboratory where the slides are examined by a veterinary pathologist.

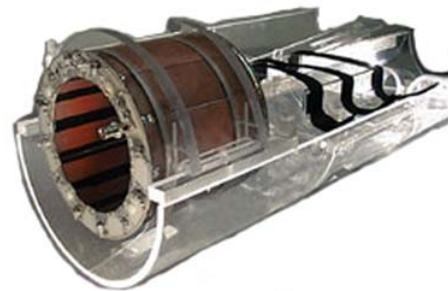


The veterinary pathologist usually adds a prognosis (what will probably happen). This may include information on local recurrence or metastasis (distant spread).

Sensitive MRI (magnetic resonance imaging) or computed tomography (CT) can demonstrate the extent of tumors.

### ***What types of treatment are available?***

The most common treatment is surgical. For benign tumors, removal of the lump is sufficient but for malignant tumors, surgery may be extensive and include amputation of the affected limb. The overriding consideration in treating dogs with malignant cancer is that 90% will die with metastatic disease despite control of the primary tumor by amputation.



MRI Machine

In some countries, chemotherapy has been used to prolong survival time. The drugs used for this are toxic to the animal, people and the environment so it has sometimes been combined with cells to stimulate the macrophages of the immune system (immunotherapy). The best system of chemotherapy is still uncertain. Another treatment used in special centers is radiotherapy as this can decrease the pain.

### ***Can these cancers disappear without treatment?***

Cancer is a multi-step process so it may stop at some stages. The body's own immune system can kill cancer cells but it is rarely 100% effective. Rarely, loss of blood supply to a cancer will make parts of it die but the dead tissue will still need surgical removal.

### ***How can I nurse my pet?***

After surgery, your pet may need to wear an “Elizabethan collar” so he or she cannot interfere with the operation site. This needs to be kept clean. Any loss of stitches or significant swelling or bleeding should be reported to your veterinarian. If you require additional advice on post-surgical care, please ask.



Pain control in bone cancer is vital, particularly for aggressive bone tumors.

If your pet is to have chemotherapy, you need to understand the risks involved in the use of these unlicensed and toxic drugs. The safety precautions required to protect yourself, other people and the environment when handling and disposing of them will be explained if you consent to their use.

### ***How will I know how the cancer will behave?***

Histopathology will give your veterinarian the diagnosis that helps to indicate how it is likely to behave. The veterinary pathologist usually adds a prognosis that describes the probability of local recurrence or metastasis (distant spread).

A blood test (for alkaline phosphatase enzymes) can predict the behavior of some limb osteosarcomas in dogs. High blood levels of bone-specific alkaline phosphatase before surgery are associated with significantly shorter survival and disease-free intervals following surgery.

### ***When will I know if the cancer is permanently cured?***

‘Cured’ has to be a guarded term in dealing with any cancer.

Non-cancerous and benign cancerous bone swellings do not spread and many stop growing at maturity. If they interfere with the mechanics of the skeletal system, they can be cured by surgical removal.

Craniomandibular osteoarthropathy has an intermittent, progressive course lasting several weeks to a few months. It may prevent your pet from eating to the extent that he or she does not have adequate quality of life.

Osteochondromas may undergo malignant transformation to osteosarcoma after some time. Chondromas may recur following surgical removal and some progress to malignancy and infiltrate locally. Chondrosarcomas of the limbs may be cured by amputation with average survival time of almost two years. Dogs with rib tumors survive an average of about three years but median survival of dogs with nasal tumors is only 210 to 510 days even with radiation therapy. Chondrosarcomas are too slow growing to respond to chemotherapy.

Osteosarcomas have a poor prognosis. High histological grade and high pre-treatment blood bone enzyme alkaline phosphatase are indicators of a particularly poor prognosis.

Less than 5% of dogs with long bone tumors have radiographically detectable metastasis to the lungs at the time of diagnosis but 75% will have them when they die and almost 90% will die within one year following amputation of the affected limb. Only 2% of affected dogs are likely to be alive two years after surgery. It is claimed that chemotherapy has improved the survival time of some dogs. Osteosarcomas of the axial skeleton metastasize less readily but survival remains approximately a year. Hypertrophic osteopathy (HPOA) can only be reversed if the lung disease can be cured.

Canine tumors affecting the head are locally aggressive rather than metastatic. Dogs undergoing removal of the lower jaw for a tumor have approximately a 70% one-year survival rate. Local recurrence leads to euthanasia. Multilobular tumor of bone behaves in a similar way. If complete removal is possible, the cancer may be cured but recurrence following surgery is the usual pattern of behavior.

Giant cell tumors are locally aggressive but rarely metastasize. Amputation may be the treatment of choice but there is limited information on success rate because they are very rare. In man benign-looking tumors have metastasized after radiotherapy.

Most joint tumors destroy local tissues and are difficult to remove surgically. Amputation is the most effective therapy but only 25% of cases have been reported to survive more than a year following diagnosis.

***Are there any risks to my family or other pets?***

No, these tumors are not transmitted from pet to pet or from pets to people.

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*This client information sheet is based on material written by Joan Rest, BVSc, PhD, MRCPath, MRCVS.  
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