



## **CANINE MAST CELL TUMOR**

Mast cell tumors (MCT) are the most common malignant skin tumors in dogs. Their behavior can vary widely from low grade tumors that are potentially curable, to aggressive tumors with the potential to metastasize (spread) to other parts of the body. Mast cell tumors are often unpredictable in their behavior. Certain factors have been defined that may help predict the behavior of mast cell tumors and help determine the best course of therapy for your pet.

One of the most important factors in predicting the behavior of mast cell tumors is the biopsy grade. Mast cell tumors are graded I, II, and III, with grade I tumors being low grade and grade III being the most aggressive. Additional factors such as location of the tumor, evidence of metastases, rapid growth of the tumor, and whether the tumor has regrown after previous surgery may also help predict the behavior of mast cell tumors. Additional tests on the tumor tissue for mutations in genes such as c-kit or proliferation panels can aid in determining a prognosis and developing a treatment plan for each individual patient.

### **How are mast cell tumors diagnosed?**

Mast cell tumors are easily diagnosed with a needle aspirate. This involves placing a small needle into the tumor and extracting cells that are then spread on a slide and evaluated under the microscope. The needle aspirate will alert your veterinarian to the presence of a mast cell tumor so that appropriate treatment may be planned. However a tissue biopsy is necessary to provide the grade of tumor.

Once a mast cell tumor is diagnosed, additional tests may be recommended prior to or following surgical removal to determine whether the mast cell tumor is confined to one area or has spread to other sites. Evaluation of the local lymph nodes is commonly performed to evaluate for evidence of metastatic disease. Other tests that may be performed, depending upon your dog's medical history, include X-rays of the lungs and abdomen, ultrasound of the abdomen and/or a bone marrow aspirate. Routine bloodwork is recommended to assess your dog's overall health. A buffy coat smear is a special blood test to evaluate for abnormal mast cells in the blood.

### **How are mast cell tumors treated?**

#### Surgery

Surgery is the mainstay of treatment for most mast cell tumors. Although these tumors often feel like a distinct lump, they often exhibit "finger-like" projections of tumor cells that extend from the main tumor and invade surrounding tissue. Thus, surgery involves removal of a wide margin of normal tissue surrounding the tumor to ensure complete removal of tumor cells. For low grade I and II tumors, where wide surgery results in complete removal of tumor, surgery may be all that is necessary to control your dog's cancer. In some cases, such as large tumors or tumors located on the legs, wide surgical removal is not possible without disfigurement. For tumors that cannot be completely removed with surgery, high grade II and III tumors, or tumors with evidence of distant spread, additional treatment such as radiation or chemotherapy may be recommended. Additional treatment may also be recommended if your dog has any factors that are associated with a more aggressive behavior of the mast cell tumor.



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### Radiation therapy

Radiation therapy is indicated for mast cell tumors of any grade that cannot be completely removed with surgery alone. Radiation therapy is well tolerated in animals. Side effects are limited to the local area that is irradiated. Radiation sickness, manifested as nausea, vomiting and diarrhea is not seen in veterinary patients. Radiation therapy is performed on a daily basis, Monday through Friday, for 3 weeks. A brief anesthetic episode is necessary so that your dog remains still during the treatment. For low grade I and II tumors, radiation therapy following surgery is very effective in controlling mast cell tumors. Should your dog have a high grade II or III tumor or exhibit any factors that may indicate a more aggressive behavior of the mast cell tumor, chemotherapy may be recommended in addition to or instead of radiation therapy. Please see the Radiation Therapy handout for more detailed information.

### Chemotherapy

Chemotherapy is indicated for high grade II and III mast cell tumors, recurrent tumors, or tumors that have spread to the lymph nodes or other sites. Chemotherapy may also be recommended if your dog has any factors that are associated with a more aggressive behavior of the mast cell tumor. Chemotherapy has also been effective in decreasing the risk of local recurrence for mast cell tumors that have not been completely excised with surgery. Two chemotherapy agents, vinblastine and lomustine (CCNU) have been shown to be effective against mast cell tumors in dogs. These drugs may be used alone or in combination. Steroids (prednisone) are also effective against canine mast cell tumors and are usually combined with the chemotherapy drugs. Chemotherapy is well tolerated in dogs. Please see the chemotherapy handouts for more detailed information.

*Tyrosine kinase inhibitors (TKIs)* are a class of chemotherapy drugs that are effective in canine mast cell tumors. Two drugs have been recently approved by the FDA: Palladia (toceranib) and Kinavet (masitinib). Both drugs have been evaluated in clinical trials and are effective against mast cell tumors in dogs. These drugs are currently being recommended for high grade II or III mast cell tumors and may be used concurrently with the conventional chemotherapy drugs or as a primary therapy. These drugs are also being recommended for dogs with multiple cutaneous mast cell tumors where surgery is not indicated. The TKIs are administered orally at home and are given for approximately 6-12 months. Blood work and response to therapy are monitored every 2-3 months. Side effects of TKIs are minimal but may include lethargy, vomiting, diarrhea and/or loss of appetite. These side effects will resolve with a “drug holiday” and decrease dose.

### **What is the prognosis?**

The prognosis for canine mast cell tumors depends on multiple factors, including the biopsy grade, c-kit status, location of the tumor, and evidence of distant spread. Prognosis also depends on the ability to achieve local control of the tumor the first time. Tumors that have recurred at the same site routinely behave more aggressively and are harder to control locally, as well as systemically, than the first time. Thus, the best time to treat your dog’s mast cell tumor is the very first time it occurs. Many dogs that have developed one mast cell tumor will develop other mast cell tumors during their lifetime. In most cases these are separate tumors and do not represent metastases of the original tumor.



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If these are low grade tumors and are controlled effectively with either surgery or surgery and adjunct therapy, long term prognosis should not be significantly affected.

For low grade I and II mast cell tumors that are controlled effectively with surgery or surgery and radiation or chemotherapy have a good long term prognosis. Most dogs will enjoy many years without the recurrence or metastases of their cancer.

For high grade III or recurrent (same site) mast cell tumors or dogs with factors associated with more aggressive mast cell tumors, prognosis is guarded. The majority of dogs (95%) will have evidence of tumor regrow or metastasis by 1 year following diagnosis and surgery alone. Chemotherapy may significantly increase your dog's cancer-free time. The effectiveness of vinblastine/CCNU/prednisone in the adjunct setting after surgery has not been published. However, clinical experience suggests that approximately 75% of patients will enjoy long term survival of 3 years or greater. The long term survival for mast cell tumors treated postoperatively with the TKIs alone or in combination with conventional chemotherapy has not yet been evaluated. Remember that mast cell tumors in dogs are one of the most unpredictable tumors and multiple factors help determine what the most beneficial course of therapy is for your dog.