



Mast Cell Tumors

Written by: *Grace Anne Mengel, VMD*

Mast cell tumors (MCT) are the most common cutaneous (skin) malignant (cancer) tumors in dogs¹. These tumors may occur at any age. Mast cell tumors may also occur in the mouth, gastrointestinal tract or in other organs, but this is far less common.

Mast cells are normally occurring inflammatory cells. They can be found in small numbers throughout the body. Mast cell tumors are clusters of mast cells that have become malignant through cell mutations. Mast cells carry several bioactive substances including histamine and heparin that play a role in the potential secondary effects of mast cell tumors.

On the skin, the tumors may be solitary or have multiple lesions. The tumors may be cutaneous or subcutaneous, firm or soft, poorly or well defined, and may or may not have hair loss associated with the lesion. Occasionally, skin ulceration is also present. Lesion(s) may occur quickly or they may be present for a length of time (months or longer) before becoming malignant. Typically mast cell tumors change in size over time, some rapidly and some more slowly. Sometimes the skin lesion(s) occur quickly and within a couple days to weeks diagnosis is made of mast cell tumor. Because of the high variability in presentation of these tumors, they have been referred to as “the great imitator.”

Cutaneous/subcutaneous MCT's most commonly occur on regions of the

trunk , followed by approximately 25 percent occurring on the limbs, and a small percentage occurring on the head and neck.³

Diagnosis:

The first step in diagnosis is a fine needle aspirate (FNA) of the lesion or lesions. This is done by a veterinarian inserting a hypodermic needle into the mass in an attempt to obtain a sample of cells from the lesion. The sample is then placed on a glass slide, prepared, and sent for evaluation by a veterinary pathologist. The pathologist will use special stains to help characterize the architecture of the cells and then evaluate the cells using a microscope. Based on the appearance of the sample cells, the pathologist will determine if a mast cell tumor is suspected.

Rarely, the dog may show other clinical signs such as lethargy, vomiting, decreased appetite, and weight loss. If these signs are associated with Mast cell disease, this is a much more severe form of disease with a more guarded prognosis.

Treatment and other considerations:

Surgical removal of the mass is the recommended treatment for MCT's. Prior to surgery, general health evaluation including blood work (complete blood cell count/CBC and chemistry screen), and urinalysis should be completed. Additionally, a lymph node aspirate of the lymph node in the region of the tumor may be recommended to check for spread of mast cell disease. This is part of

the “staging” process. “Staging” helps to further characterize disease and determine long-term prognosis. Imaging such as abdominal radiographs (x-rays), abdominal ultrasound, and chest radiographs may also be considered.

At surgery, the surgeon will attempt wide margins meaning removal of the mass and some healthy tissue surrounding the lesion in an attempt to completely remove the tumor. After removal, the mass is sent to a pathologist for further evaluation including “grading” and determination of complete excision.

MCT’s are graded according to histologic (microscopic tissue and cells) evaluation using special stains. Commonly MCT’s are classified as Grade 1 (well differentiated,) Grade 2 (intermediate differentiation,) or Grade 3 (poorly or undifferentiated) tumors. Grade 1 tumors have an excellent prognosis with complete surgical excision. Grade 2 tumors also have a very good to excellent prognosis with complete surgical excision. Grade 3 tumors often require additional treatment to surgical excision including radiation therapy and/or chemotherapy. Grade 3 tumors carry a more guarded long-term prognosis.

Grade 2 tumors are the most commonly diagnosed. Because of the somewhat subjective nature of evaluation, especially in Grade 2 tumors, diagnosis is very pathologist dependant. There is a wide range of variability among Grade 2 MCT’s tumors. Therefore complete evaluation of the patient is important. Generally, as mentioned above, long-term prognosis for Grade 2 MCT’s that are completely excised is very good.

If the pathologist determines that the surgical margins are not “clean” meaning that some cancerous cells were not removed, it is often recommended that another surgery be performed to remove the remaining cells. If surgical removal is not possible due to location, radiation or chemotherapy may be recommended.

Recurrence rate of Grade 1 and Grade 2 tumors is approximately 5%. Dogs with a history of MCT may have a 10-15 % chance of developing additional MCT’s at some point in time.

Grade 3 tumors carry a more guarded long-term prognosis and often require more treatment in addition to surgical removal of the mass. Additional treatments include radiation and/or chemotherapy. Grade 3 tumors are more likely to have spread to other regions of the body such as liver and spleen causing additional disease. Chemotherapy is often aimed at addressing the cancer that has spread. Additional diagnostic tests mentioned above such as abdominal ultrasound help to determine locations of metastatic disease. Fine needle aspirates of organs such as liver and spleen also help to determine the extent of disease metastasis.

Rate of metastasis (cancer spread) in Grade 1 and 2 tumors is less than 10 percent. In Grade 3 tumors, the rate is greater than 50 percent².

Mast cell tumors, in general, may cause localized and systemic reactions caused by the release of certain bioactive substances from mast cells. Histamine released from mast cells may cause local swelling, irritation, and itching and may be responsible for the varying size of an individual lesion. There are 2 types of histamine: H1 and H2. H1

is associated with vasodilation and localized reactions. H2 is associated with gastric (stomach) irritation and ulcers. Release of H2 may lead to systemic effects that include gastric irritation and ulceration that may cause vomiting and decreased appetite.

Because MCT's may release histamine, histamine blockers are often recommended prior to and after surgery. A common H1 blocker is diphenhydramine (Benadryl®). H2 blockers include famotadine (Pepcid®), cimetadine (Tagamet®), and omeprazole (Prilosec®).

MCT's may also release heparin, which can cause increase bleeding at the incision site when removing the mass. Usually, this increased bleeding is not a significant complication.

Genetics/heritability and risk factors of disease:

There is little known regarding the heritability of mast cell tumors. To the author's knowledge, little research has been done regarding the genetic implications of mast cell disease.

There are no clear risk factors for mast cell tumors in dogs. Some cases have been linked with chronic skin allergies or inflammatory disease. In rare cases there has been a possible link to a local irritant, but overall there is no conclusive evidence available.

It is considered that certain breeds are more prone to mast cell tumors. These breeds include Boxers, Boston Terriers, Beagles, Bulldogs, Golden Retrievers, Labrador Retrievers, Schnauzers, Shar-Peis, and Jack Russell Terriers. Mixed breed dogs are also noted to have a high incidence.

Among veterinary specialists (most notably reproduction/genetics specialists and oncologists) and general practitioners, there is a wide variation of opinion regarding breeding of dogs that have had a mast cell tumor considered Grade 1 or Grade 2 and successfully treated with surgical removal of the tumor. Some feel that a dog/bitch with a history of MCT should not be bred. Others feel that if the dog/bitch has many other good traits to offer the breed, and there is no other evidence of MCT's among parents and littermates, or the potential mate, that breeding is okay.

Collective efforts by canine breed associations, veterinarians, and researchers are key to tracking and studying mast cell tumors and other diseases. Hopefully, over time more evidence will become available regarding the risk factors, heritability, and treatment of mast cell tumors in dogs.

1. Kent, MS. "Mast Cell Tumors: Diagnosis and Treatment," proceedings from Canine Medicine Symposium 2011.
2. Cote, E. **Clinical Veterinary Advisor: Dogs and Cats**. Mosby Elsevier. St Louis, MO. 2007. 685-6.
3. Dernell, WS, Vail, DM. "Mast Cell Tumors: Surgical and Medical Management," proceedings from 108th Penn Annual Conference March, 2008.