

Mammary Carcinoma

What are mammary tumors and their clinical signs?

Mammary tumors are one of the most common tumors diagnosed in the female dog. Most mammary tumors are found incidentally, when owners are petting or grooming their pets. About 70% of mammary tumors occur in the caudal mammary glands, and there are usually multiple mammary glands involved (>50% of cases). Of all canine mammary tumors, approximately 50% are malignant, and the majority of the malignant tumors are carcinomas. These tumors can arise from the ductal or alveolar region of the mammary gland, and primary tumor characteristics (rapid growth, ulceration, invasiveness into local tissue) as well as the presence of regional/metastatic disease are considered most associated with a malignant tumor. The remaining tumors are benign in nature and are usually secondary to mammary tissue hyperplasia.

The development of both benign and malignant tumors is hormone-dependent, and spaying early in life has been shown to reduce the risk of tumor formation. If a dog is spayed before her first heat, there is a 0.05% risk of developing a malignant mammary tumor, an 8% risk if spayed after one heat, and a 26% risk if spayed after the second heat. Additional risk factors in the development of canine mammary tumors include obesity and exogenous supplementation of hormones (ie progestins). Approximately 10% of dogs develop a unique presentation of mammary cancer called inflammatory carcinoma, most commonly appearing soon after completing a heat cycle. Many of these dogs have generalized clinical signs (ie lethargy, malaise, inappetance, increased thirst/urination), evidence of swelling of the limbs/skin, and their affected mammary glands appear hot, painful, and swollen. This presentation is occasionally misdiagnosed as mastitis.

How are mammary tumors diagnosed and staged?

A biopsy is recommended to obtain a diagnosis and to determine the best treatment options. In most cases of canine mammary tumors, a fine needle aspirate is NOT able to distinguish benign from malignant tumors. In the event of atypical mammary tumor presentations, a fine needle aspirate can be used to determine if the mass is of mammary origin and rule out other possibilities.

In addition to tumor sampling, a thorough staging evaluation is recommended (a physical examination, bloodwork, urinalysis, and thoracic/abdominal imaging). A physical examination is needed to assess for the presence of additional mammary masses, to evaluate the regional lymph nodes, and to determine if other concerning changes are present. Coagulation profile testing is frequently needed in those cases presenting with extensive, ulcerative masses suspicious of inflammatory carcinoma. Additional imaging, including thoracic radiographs and abdominal imaging (ie radiographs or ultrasound) are frequently used to help identify evidence of regional or distant disease spread, or metastasis.

Staging includes 5 classifications based on the Tumor, Node, Metastasis (TNM) system:

Stage 1 (T1N0M0): Tumor is less than 3 cm, no metastatic disease regionally/distantly

Stage 2 (T2N0M0): Tumor is between 3-5 cm in size; no metastatic disease regionally/distantly

Stage 3 (T3N0M0): Tumor is >5 cm in size; no metastatic disease regionally/distantly

Stage 4 (T1-3N1M0): Any tumor size; evidence of metastatic disease regionally but not distantly

Stage 5 (T1-3N0-1M0): Any tumor size +/- the presence of regional node metastasis with evidence of metastatic disease distantly

How are mammary tumors treated?

- **Surgery:** Surgery is the treatment of choice for the management of benign and most malignant mammary tumors in the dog. Spaying at the time of surgery in intact female dogs can reduce and potentially address some benign mammary gland hyperplasia; however, no protective benefit against the development of additional malignant mammary tumors has been found when dogs are spayed later in life (>2.5 yrs of age). The extent of surgery is determined by the size, fixation of the mass to surrounding tissues, and number of lesions. Typically, these tumors are removed with at least one mammary gland and their respective draining lymph nodes. The sample is then submitted for histopathology.
- **Radiation Therapy:** The role of radiation therapy has not been defined in the management of canine mammary tumors, even in the setting of incomplete resection. It is plausible to consider palliative radiation therapy for those tumors that are too extensive to surgically excise or for the management for pain, edema, and discomfort associated with inflammatory carcinomas. In these presentations, the benefit from this option is short term.
- **Chemotherapy:** The efficacy of chemotherapy has been minimally evaluated in dogs with mammary carcinoma. However, our group will recommend the consideration of chemotherapy as an adjuvant therapy to reduce the metastatic potential associated with more advanced tumor stages or aggressive tumor histologies, irresectable tumors, or when metastatic disease is present. An estimated 25% chance of benefit, characterized by regression of >50% of the original tumor burden, is anticipated in the setting of measurable disease. An increased benefit is suspected for microscopic disease. Common chemotherapeutics used include Doxorubicin, 5-fluorouracil, cyclophosphamide, and taxane chemotherapy (ie paclitaxel).
- **Hormonal Therapy:** No definitive benefit has been noted in dogs with mammary carcinomas based on several small studies investigating the use of hormonal therapies in dogs (ie tamoxifen). It is possible that those tumors expressing hormonal receptors for estrogens and progestins may be more sensitive to this treatment approach; however, testing for hormonal expression in tumors is not readily available at this time.
- **Investigational/Clinical Trial Opportunities:** Investigational options and/or clinical trials may also be considered if available and if patients are eligible for inclusion.

What is the prognosis associated with mammary tumors?

The prognosis post-operatively associated with malignant canine mammary tumors is influenced by several factors including tumor type, tumor size and clinical stage.

- Mixed mammary, tubular/papillary, well-differentiated carcinomas exhibit a more benign phenotype, whereas poorly differentiated carcinomas, carcinosarcomas and sarcomas are associated with a more malignant behavior, and carry shorter survival times.
- Inflammatory carcinomas are highly aggressive and survival is typically less than one month.
- Median survival times and local tumor recurrence rates are significantly better for dogs with tumors measuring <3cm. Similarly, survival times are improved for dogs with lower stage disease.