Mammary Tumors in Dogs: How Common Are They?

Mammary tumors are the most common tumor in intact female dogs. There is a lower incidence of mammary tumors in dogs in the US than in Europe because of the higher rate of ovariohysterectomy in this country. In one long-term study conducted in a colony on intact female research Beagles, 70% developed at least one mammary tumor in their lifetime.

What Does Age Have to Do With Mammary Tumors?

A dog’s risk of developing mammary tumors becomes significant at 7-8 years of age and increases until 11-13 years of age. Dogs with malignant tumors are generally older than dogs with benign tumors.

Mammary Tumors and Hormones

Hormones have a clear and demonstrable influence of the development of mammary tumors. Dogs spayed prior to first estrus have a 0.5% risk of developing mammary tumors compared to unspayed dogs. Dogs spayed prior to their second heat cycle have an 8% risk and dogs spayed prior to their third heat cycle have a 26% risk of developing mammary tumors compared to unspayed dogs. Both exogenous estrogens and progestins increase the risk of a dog developing mammary tumors.

Estrogens induce mutations in mammary gland tissue. Progesterone promotes production of growth hormone which in turn stimulates production of insulin-like growth factor 1 (IGF-1). IGF-1 induces proliferation and survival of breast epithelium and regulates expression of genes associated with cancer development.

Breeds and Other Risk Factors

Smaller breeds and purebred dogs have an increased risk of breast cancer. Poodles, Chihuahuas, dachshunds, Yorkshire terriers, and Maltese are small breed dogs with reportedly higher incidences of mammary tumors. Cocker spaniels, English springer spaniels, Brittany, German shepherds, Pointers, Dobermans, and Boxers are medium and large breed dogs with an increased incidence of mammary tumors.

Increased body weight, especially during puberty, increases the risk of mammary tumor development. Obesity decreases sex hormone binding globulin
levels resulting in increased serum estrogen levels. In addition, adipose tissue may convert androgens to estrogens via aromatase.

The Mammary Tumor Continuum

Benign and malignant mammary tumors are not separate, distinct entities. Areas of malignant transformation are seen in benign tumors, leading researchers to believe that these tumors are both a biologic and histologic continuum.

Workup and Staging

A thorough physical examination is performed and all mammary glands and regional (axillary and inguinal) lymph nodes are evaluated. A complete blood count and biochemistry screen are required as the majority of dogs are older and may have concurrent diseases. Three view thoracic radiographs are taken to evaluate the lungs for metastatic disease. Fine needle aspiration of regional lymph nodes and cytological evaluation provides important information on prognosis. Lymphatic drainage is complex with drainage to multiple ipsilateral and contralateral lymph nodes. Variation increases in neoplastic glands due to tumor induced lymphangiogenesis.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Tumor Size</th>
<th>Lymph Node Status</th>
<th>Metastases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>T1: &lt; 3cm</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>Stage 2</td>
<td>T2: 3-5cm</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>Stage 3</td>
<td>T3: &gt;5cm</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Any size</td>
<td>N1 (positive)</td>
<td>M0</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Any size</td>
<td>Any</td>
<td>M1 (metastases)</td>
</tr>
</tbody>
</table>

Prognostic Factors

Tumor size: Tumors larger than 5 cm diameter have a worse prognosis. Tumors >40 cc³ volume have a worse prognosis.

Lymph node involvement: Lymph node involvement is a poor prognostic indicator.

World Health Organization (WHO) stage: Dogs with higher WHO stage have a worse prognosis.

Surgery

There are many options for dogs with mammary tumors: Simple lumpectomy? Mastectomy? Regional mastectomy? Unilateral or bilateral radical mastectomy? In one study comparing unilateral radical mastectomy and simple mastectomy in a population of 144 dogs, there was no difference in disease free interval between the groups. (MacEwen et al, 1985). However in a study comparing unilateral radical mastectomy and regional mastectomy in 99 intact female dogs, 58% dogs in the
regional mastectomy group developed new tumor in the remaining ipsilateral mammary tissue.

Feline Mammary Tumors

Feline mammary tumors are far more aggressive than those in dogs with the vast majority being malignant. Older cats, purebred cats and sexually intact females are at increased risk of developing mammary tumors. Ovariohysterectomy is protective, but only up to two years of age.

Staging

Staging of mammary tumors in cats is similar to that in dogs, with one major exception: Cats with tumors more than 3 cm in diameter are automatically classified as grade 3 tumors regardless of lymph node metastases because of the poorer prognosis associated with larger tumor size in cats. Prognostic factors include a higher histologic grade, tumor size, lymphatic invasion, vascular invasion, and lymph node metastases.

Prognostic Factors

Tumor size has been shown to be clearly associated with survival. Tumors less than 2cm in diameter (8cm³ in volume) have a median survival time of greater than 3 years with surgery alone. Cats with tumors 2-3cm diameter (8-27cm³ volume) had a two year survival time, and cats with tumors >3cm diameter (>27cm³ volume) had a median survival time of 6 months.

Lymphatic Drainage

Lymphatic drainage of the first two mammary glands in cats is to the accessory axillary lymph nodes. Gland 4 drains to the superficial inguinal lymph node. The third gland can drain to either the axillary or inguinal node. It is also important for accurate staging to note that glands 3 and 4 can drain to the medial iliac lymph nodes and glands 1-3 can drain to the cranial sternal lymph nodes. Staging should therefore involve blood work, thoracic radiographs, and abdominal ultrasound. Enlarged lymph nodes or those that appear abnormal on ultrasound should be aspirated.

Surgery

Cats with mammary tumors require aggressive surgery. Local lumpectomy or regional mastectomies cannot be recommended. Unilateral or bilateral radical mastectomy with lymph node removal is recommended. Recent information currently awaiting publication suggests that cats receiving simultaneous bilateral radical mastectomy have a better survival than cats that receive staged bilateral radical mastectomies.