

Clinical features

When thinking about clinically important features, one of the main concerns is the **biological behaviour** of the particular type of cancer. With canine mammary cancer, size does matter – a mass >3 cm does not carry a good prognosis, regardless of breed. In addition to size, the rate of growth and invasiveness of the mass is also important as are the appearance of the skin surrounding the mass and whether or not there are multiple lesions.

The status of all lymph nodes that drain the area/gland where the mass is located is also important and this is why staging is often essential before surgery. If the mass is suspected to be malignant, then staging becomes even more important to assess the draining lymph nodes and lungs.

Two common questions that both owners and vets ask of oncologists and pathologists are: “Can I guess if a mammary tumour is malignant or benign prior to surgery?” and “Can I leave a mammary tumour in a dog if it is benign?” The answer to the first depends on the history, clinical features and staging concerns. The answer to the second can be yes ... if the mass is not growing ... but cells can become malignant over time – due to the influence of hormones ... so it is best to remove the mass when it is small and benign and before malignancy develops.

Clinical prognostic factors

Clinical prognostic factors are characteristics associated with the course and outcome of cancer that can help predict a patient's prognosis. These factors are important for clinicians to assess the likely progression of the disease and guide treatment decisions. Prognostic factors can vary depending on the type and stage of cancer. The commonly considered clinical prognostic factors for canine mammary cancer include the following:

- Age – there is a higher prevalence if malignant neoplasia with increasing age of the dog.
- Tissue invasiveness, diffuse growth and skin involvement are all negative prognostic factors.
- Ulceration – if the mass is ulcerated, the prognosis is not as good as if the overlying tissues are intact and not ulcerated. Ulceration often accompanies rapid growth.
- Size of the mass (T) when it is >3 cm is associated with shorter reported median survival times (the length of time it takes for 50% of affected dogs to die of their disease)
- Lymph node metastasis (N)
- Distant metastasis (M)

Diagnosis

Another common question that is asked is about the usefulness of cytology after a fine needle aspirate (FNA) of a mammary mass. Cytology is useful to rule in/out inflammatory causes, non-mammary neoplasia (lipoma, mast cell tumour, melanoma, subcutaneous haemangiosarcoma) and to rule in/confirm malignant mammary tumours. However, histology of the removed mass is required for definitive diagnosis and prognosis.

There are two occasions when a pre-operative biopsy is indicated and these are when there are skin metastases (spread of mammary tissue to the skin) or evidence of an inflammatory mammary carcinoma.

Staging

Cancer staging is a standardised way of describing the extent of a cancer's spread that helps in planning appropriate treatment and predict a patient's prognosis. Staging systems vary depending on the type of cancer, but the most commonly used system is the TNM staging system. The TNM system provides a detailed description of the primary tumour (T), regional lymph nodes (N), and distant metastasis (M). Staging allows for consistent communication among healthcare professionals and researchers. Different types of cancer may have specific staging systems tailored to their characteristics and patterns of spread. As research advances, staging systems may be refined to guide treatment decisions and provide more accurate prognostic information (Table 1). For staging, a full physical examination with measurement of any mass(es) and lymph node palpation (with fine needle aspiration if necessary and possibly ultrasound), chest x-rays and/or CT may be required.

Tumour size and presence of metastasis to regional lymph nodes (LNs) or distant sites all have prognostic implications and this is why staging is needed prior to surgery. Any suspicious LNs or organs should be checked with fine needle aspiration (FNA) for cytology or biopsy for histopathology to confirm metastasis. Locating draining lymph nodes may require imaging.

Table 1. The TNM clinical staging system for canine mammary tumours modified from the WHO (World Health Organization).

Clinical stage	Tumour diameter (T)	Regional lymph node involvement (N)	Distant metastasis (M)
I	≤ 3 cm (T1)	Negative (N0)	Negative (M0)
II	3 – 5 cm (T2)	Negative (N0)	Negative (M0)
III	> 5 cm (T3)	Negative/Positive (N0)	Negative (M0)
IV	Any (Any T)	Positive (N1)	Negative (M0)
V	Any (Any T)	Either (Any N)	Positive (M1)

Surgery

Treatment involves surgical removal and histology for a definitive diagnosis. When there are multiple masses, they should all be removed and undergo histology as >60% will have a different diagnosis. The planned surgical approach will depend on the size of the mass(es). General guidelines are that lumpectomy vs mastectomy is based on a size <3 cm with a partial strip being recommended when a mass is >3 cm or is located between mammary glands. A full strip is recommended when there are too many lesions. For masses >3 cm, the aim is to achieve 2 cm margins and for a mastectomy, deep margins down to the fascia is recommended. If a mass is a recurrence or very infiltrative, then removing the fascia is also recommended.

LN removal is recommended when there is a high risk of metastasis after clinical staging is completed. Draining lymph node resection should take place after checking lymphatic drainage anatomy (Table 3). An anatomical approach has been described for axillary LN removal with cranial mammary masses and if mastectomy includes the 5th or 4th and 5th mammary glands, then inguinal LN removal is recommended. With negative prognostic factors such as an older aged dog with a large, ulcerated mass, surgical removal with wide margins (partial strip) and LN removal are recommended. However, there is no difference in survival for a full strip which has the potential to result in more post-operative complications.

Histologic grading

Another common question is whether histology after surgical removal of a mammary mass is useful and the answer is an unreserved yes! While pre-operative cytology or biopsy is usually not indicated, post-surgical histopathological diagnosis is recommended. About 50% of mammary masses are benign and it is reassuring for owners to know this after surgical removal of a mass. For the remaining 50% of masses that are malignant, histopathology is useful for histologic grading to help predict potential for recurrence and/or metastatic risk. The histology report contains important information about grading and prognosis (Table 2). It also contains information about lymphatic invasion (presence/absence), margin assessment and lymph node status. If lymphatic invasion is present, metastasis is possible even if it is not picked up clinically. Also, some specific tumour types are associated with more aggressive malignant behaviour (locally ± metastasis). Inflammatory carcinomas tend to have diffuse skin lymphatic extension and the prognosis is usually <3 months, meaning surgery is contraindicated and palliative therapy/euthanasia is recommended.

Table 2. Histologic grade and prognosis.

Histologic grade	Risk of recurrence with narrow margins	Risk of metastasis
I and II	9 – 12%	19 – 30%
III	32%	87%

Risk of metastasis

Target organs for metastasis of canine mammary cancer are the lungs and lymph nodes draining the mammary glands. Any action against metastasis depends on the estimated risk (based on tumour size, histologic grade and clinical stage). Periodic staging can help to assess and manage this risk and is always recommended for those cases where there is a high risk of metastasis or it is already present.

Chemotherapy and radiotherapy

There is weak evidence for improvement of survival times in metastatic mammary cancer or with inflammatory carcinomas. There is no documented evidence for any % decrease in metastatic rate compared to surgery alone but this is also partially due to a lack of optimally designed studies. Various chemotherapy drugs (doxorubicin, mitoxantrone, carboplatin, toceranib, COX-2 inhibitors) have been tried but should only be considered after complete wide resection and possibly also removal of regional lymph node(s).

Radiotherapy has been tried with inflammatory carcinomas or with extensive skin involvement or nonresectable carcinomas and it can improve survival compared to medical therapy alone.

To spay or not to spay?

A final common question is about the benefits of spaying a dog after a diagnosis of a mammary tumour. We know that 50% of intact female dogs will develop at least one mammary tumour and that mammary tumours which occur in spayed dogs are more frequently malignant. We also know that spaying at the time of diagnosis of a benign mammary tumour will decrease the risk of further mammary tumours by 50%. However, ovariectomy after diagnosis of a malignant mammary tumour does not change survival ... except for grade II adenocarcinomas or if there are high preoperative oestradiol levels.

The content of this information sheet does not constitute advice and should not be relied upon in making or refraining from making, any decision. ACT recommends discussing this with your vet practice.