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Mammary Neoplasms

Introduction and Overview of Mammary Neoplasia

This lecture addresses mammary neoplasms in small animal practice, with emphasis on their biological behaviour, classification, diagnosis, and surgical management. Mammary tumours occur along a spectrum of increasing malignancy, ranging from benign adenomas to highly aggressive carcinomas. An understanding of this continuum is essential when considering grading systems, prognostic factors, and surgical approaches. Particular attention is given to indications for local, regional, unilateral, or bilateral chain mastectomy, as well as the decision-making process surrounding ovariohysterectomy and the timing of spaying in relation to tumour development.

Epidemiology and Biological Behaviour

Approximately fifty per cent of mammary tumours in female dogs are malignant, whereas the vast majority of mammary tumours in cats are malignant. Mammary tumours in male dogs are rare but are almost always malignant, although the overall mortality rate remains low. Only around four per cent of dogs with malignant mammary carcinoma die as a direct consequence of the disease.

Multiple mammary tumours are commonly observed in adult dogs, including small breeds, and this often necessitates more aggressive surgical intervention. Malignant mammary tumours metastasise via both haematogenous and lymphatic routes, with common metastatic sites including regional lymph nodes, lungs, bone, brain, skin, and other visceral organs. Tumours arising in the fourth and fifth mammary glands are particularly prone to pulmonary metastasis due to the larger volume of mammary tissue present in these glands and the higher likelihood of malignancy.

Risk Factors and Hormonal Influences

Obesity and high-fat diets increase the risk of mammary tumour development. Dogs that remain lean during their first year of life have a reduced risk. Homemade diets rich in beef and pork and low in chicken have also been associated with increased incidence. Exogenous progestins stimulate growth hormone production and can lead to increased proliferation and transformation of mammary epithelial cells. Historical use of oestrogenic and progestogenic

compounds, including mismating injections, has similarly been associated with increased risk of mammary neoplasia.

Hormonal status plays a significant role in tumour development. Early spaying confers a protective effect against mammary tumour formation, whereas spaying after approximately two and a half years of age offers little to no protective benefit. Decisions regarding ovariohysterectomy at the time of tumour removal should therefore be based on individual patient factors and discussion with the owner.

Classification and Clinical Presentation

Mammary tumours encompass a range of benign and malignant histological types. Benign tumours include adenomas and mixed tumours, whereas malignant forms include simple carcinomas, complex carcinomas, carcinosarcomas, and inflammatory carcinomas. Inflammatory mammary carcinomas and carcinosarcomas are particularly aggressive and debilitating.

Clinically, tumours may present as single or multiple masses associated with the mammary glands or nipples. Approximately sixty-five to seventy per cent occur in the fourth and fifth mammary glands due to the greater volume of tissue in this region. Benign tumours are often small, firm, well circumscribed, and non-fixed, sometimes described as “BB-sized” nodules. These may be associated with the teat or entirely within the glandular tissue.

Malignant tumours typically exhibit rapid growth and may ulcerate as they outgrow their blood supply. Ulceration is particularly common in the caudal mammary glands within the inguinal region. Cutaneous metastasis may result in vesiculopustular dermatitis with moist, painful exudation, especially in inflammatory carcinomas and carcinosarcomas. Lymph node metastasis can produce extensive local skin changes, compounded by moisture accumulation between adjacent mammary tissues.

Lymphatic Drainage and Metastatic Pathways

Lymphatic drainage of the mammary glands is variable and bidirectional. Cranial glands may drain towards the axillary lymph nodes, while caudal glands often drain to the superficial inguinal lymph nodes. However, this pattern is inconsistent, and overlap is common. Inguinal lymph nodes are more readily palpable and are more frequently affected than axillary nodes. Superficial inguinal lymph nodes drain to the medial iliac lymph nodes, making abdominal imaging an important component of staging.

Diagnostic Approach

Diagnosis is based on thorough physical examination, including rectal examination to assess for sublumbar lymphadenopathy or rectal canal compression. Baseline haematology and biochemistry are recommended, as hypercalcaemia may occur as a paraneoplastic syndrome. A coagulation profile should be performed in patients with extensive disease or inflammatory carcinoma due to the increased risk of disseminated intravascular coagulation.

Fine needle aspiration is a valuable diagnostic tool, as mammary tumours are highly exfoliative. Cytology readily identifies epithelial neoplasia and metastatic involvement of lymph nodes, although differentiation between benign and malignant lesions may be challenging. Biopsy may be required to confirm malignancy or identify inflammatory carcinoma.

Ultrasonography is useful for evaluating sublumbar and medial iliac lymph nodes and assessing tumour architecture. Benign tumours often have regular margins and homogeneous echogenicity, whereas malignant tumours tend to show irregular margins and heterogeneous internal structure.

Surgical Management

Surgery remains the primary treatment modality for mammary tumours, particularly those that are ulcerated or causing significant discomfort. Surgical intervention is often palliative in advanced cases. The goal is complete excision of neoplastic tissue using the simplest effective technique. Options include excisional biopsy, local mastectomy, regional mastectomy, and unilateral or staged bilateral chain mastectomy.

In cases of confirmed metastatic disease or inflammatory carcinoma, surgery does not improve survival time and should only be undertaken following clear discussion with the owner regarding palliative intent. Radical procedures may reduce the development of new tumours but are associated with increased morbidity and postoperative pain.

Excisional Biopsy and Local Mastectomy

Excisional biopsy or lumpectomy is appropriate for very small tumours measuring less than 0.5 cm that are well circumscribed, mobile, and non-fixed. A wide excision with margins of 0.5 to 1 cm is recommended due to the high incidence of malignancy. Local mastectomy is indicated for lesions larger than 1 cm, those fixed to underlying tissues, or those clearly associated with a single mammary gland. Dissection should extend to the body wall, including removal of part of the external rectus sheath if fixation is present.

Regional and Chain Mastectomy

Regional mastectomy is indicated for large tumours involving adjacent glands, with or without lymph node involvement. Surgical planning is guided by lymphatic and venous drainage rather than strict anatomical location. Elliptical incisions are made around the affected glands, and dissection proceeds to the external rectus sheath. Caudal dissection is recommended initially to allow early ligation of the superficial epigastric vessels, reducing haemorrhage. The external pudendal vessels may be ligated when performing en bloc resection including the inguinal lymph node.

Closure may require drains and advanced reconstructive techniques. Flank fold flaps can be rotated to cover caudal defects, particularly in the inguinal region. Walking sutures are frequently employed to manage tension and achieve closure, often resulting in complex incision patterns.

Bilateral Mastectomy and Reconstructive Considerations

Bilateral radical mastectomy is generally performed in a staged manner to reduce complications associated with wound closure, particularly in breeds with limited skin elasticity such as Greyhounds, Dachshunds, Weimaraners, and some cats. Acute skin stretching techniques, including the use of Velcro-based tension devices, may facilitate closure. Drains are almost always required to manage dead space and may also be used for local anaesthetic delivery.

Prognostic Factors

Negative prognostic indicators include tumour size greater than 3 cm, ulceration, high histological grade, lymph node involvement, vascular invasion, distant metastasis, and pulmonary spread. Additional adverse factors include lack of oestrogen receptor expression, DNA aneuploidy, and aggressive cellular characteristics.

Summary and Clinical Implications

In dogs, approximately half of mammary tumours are benign and half malignant. Partial resections require careful ongoing monitoring due to the risk of malignant transformation. Around fifty per cent of malignant tumours metastasise, most commonly to the regional lymph nodes and lungs. Comprehensive staging is essential, as cytology alone cannot reliably distinguish benign from malignant disease. Biopsy and imaging therefore play critical roles in management and prognostication.