

A case of invasive mammary carcinoma in a female dog: Histological and immunohistochemical study

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ABSTRACT

Mammary tumours are the most frequently found neoplasm in unspayed female dogs and most of them exhibit malignant characteristics. This case report presents a 14-year-old female dog with an ulcerated mass in the left caudal inguinal mammary gland. Clinical examination, diagnostic imaging, cytology and histopathological assessment confirmed the neoplasm as invasive mammary carcinoma. Histopathological examination revealed absence of tubule formation, high-grade nuclear atypia and frequent mitoses consistent with aggressive morphology. Neoplastic epithelial cells showed invasion into the surrounding connective tissue stroma forming varying numbers of cellular aggregates. This case emphasizes the importance of early diagnosis and comprehensive histomorphological assessment for determining prognosis and treatment strategy.

Keywords: Dog, histological, immunohistochemical, mammary carcinoma

Canine mammary tumours (CMTs) comprise the most prevalent neoplasm observed in female dogs encompassing nearly half of all mammary gland tumours¹. A wide range of biological spectrum can be displayed by these neoplasms varying from benign forms to invasive malignant forms. Hormonal factors specially estrogen and progesterone play a pivotal role in development of these tumors. Early spaying significantly reduces the risk of mammary tumour development underscoring the hormonal dependency of mammary tumor genesis in canines². Several mammary neoplasms exhibit malignant behaviour involving local invasion and distant metastasis. Invasive mammary carcinoma constitutes a remarkable clinical challenge due to its aggressive behaviour, poor prognosis and chances of recurrence. CMTs show similarities to human breast cancers making them useful models for comparative oncology. This resemblance has prompted interest in using canine neoplasia to understand the tumour biology and to develop new therapeutics³. This report presents a case of invasive mammary carcinoma in a female dog, emphasizing the clinical presentation, diagnostic findings and histopathology.

A 14-years-old non-descript female dog was presented to the Referral Veterinary Polyclinic and Teaching Veterinary Complex, ICAR-IVRI, Izatnagar, Uttar Pradesh with a history of progressively developed swelling in the left caudal inguinal mammary gland since one and a half months. On clinical examination, an ulcerating, exudating, soft to firm and pedunculated mass measuring 2.3x2.1 cm was observed (Fig. 1). The physiological parameters of the dog were within the normal range. Fine needle aspirate from the tumour mass was taken and stained using Giemsa stain. Thoracic radiograph and ultrasonography of abdominal region was done to detect presence of metastatic lesions. Surgical excision of the mass was done and the tissue was preserved in 10% neutral buffered formalin (NBF). Histopathological evaluation of the section was done after haematoxylin and eosin (H&E) staining. Grading was done based on tubule formation, nuclear pleomorphism and mitosis per ten high power field (hpf)⁴.

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Metastasis to lungs was not observed in the thoracic radiograph. Ultrasonography revealed the presence of an ill-defined, heterogenous lesion measuring 13x8 mm in spleen (Fig. 2). Giemsa stain of fine needle aspirate collected from mammary gland tumour revealed loosely cohesive cluster of neoplastic cells with indistinct cell borders. Pleomorphic nuclei were observed with coarse chromatin, vacuolations and prominent nucleoli (Fig. 3). Histopathological evaluation revealed infiltrative nests of tumor cells forming lobular patterns and infiltrated into the stroma (Fig. 4a-c). The neoplastic cells were identified either as individual cells or arranged in

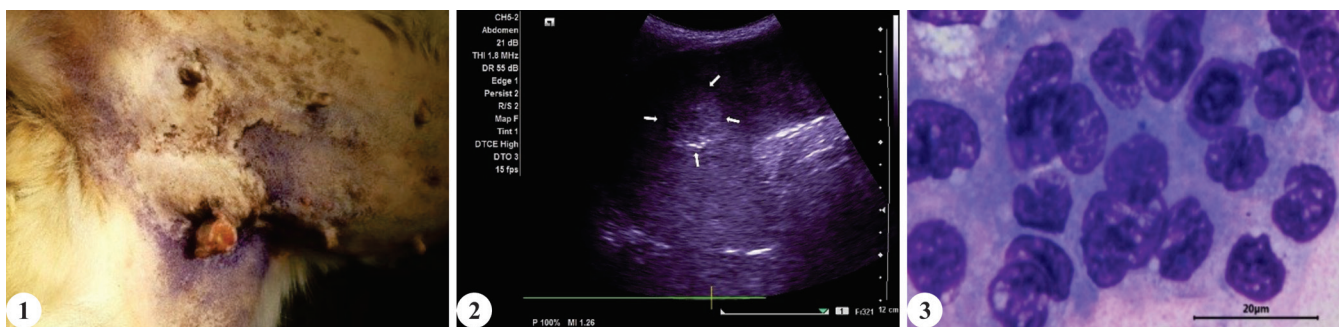


Fig. 1. Dog showing nodular ulcerated tumour growth with irregular margins in left inguinal mammary gland; **Fig. 2.** Ultrasonograph showing an ill defined lesion measuring 13*8 cm in spleen; **Fig. 3.** Cytological smear revealing cluster of neoplastic cells with highly pleomorphic nuclei, coarse chromatin with nuclear vacuolations and prominent nucleoli (Giemsa x1000).

irregularly distributed tumour islands within the stromal component, lacking tubule formation and exhibiting high-grade nuclear atypia. Mononuclear inflammatory cells were noted surrounding the neoplastic cells. The neoplastic epithelial cells were characterized by indistinct cytoplasmic boundaries and marked pleomorphism, with frequent mitotic figures. Connective tissue proliferation was evident in the mesenchymal component. Based on these findings the tumour was categorized as a high-grade tumour. Histological grading remains a significant prognostic factor, with higher grades correlating with increased aggressiveness and poorer outcomes⁵.

Immunohistochemistry was performed for estrogen receptor (ER) and progesterone receptor (PR). Nuclear immunoreactivity for ER was not observed in neoplastic cells (Fig. 5a). Nuclear immunoreactivity for progesterone receptor (PR) was detected in approximately 30% of neoplastic cells with moderate staining intensity, indicating partial hormone receptor positivity (Fig. 5b). Canine invasive mammary carcinomas present diverse histological types, including solid, tubular, lobular, papillary and adenosquamous types. These tumors are characterized by infiltrative growth into surrounding stromal tissues, presence of neoplastic epithelial cells with varying degrees of pleomorphism and frequent mitotic figures. The stromal response often includes mononuclear inflammatory cell infiltration and

connective tissue proliferation⁶.

Histological grading remains a significant prognostic factor with higher grades correlating with increased aggressiveness and poor outcomes⁵. A remarkable reduction in ER expression has been observed as tumour progresses to malignant types particularly invasive carcinoma³. ER-positive canine mammary carcinomas are often associated with better prognosis, including lower histological grade and longer survival times⁷. The presence of hormone receptors like ER and PR may also suggest the potential responsiveness of these tumors to hormonal therapy^{8,9,10}. Normal and benign neoplasms express both ER and PR¹¹, whereas low ER expression is associated with worse prognosis in malignant mammary neoplasms¹².

The present case emphasizes the aggressive behaviour of canine invasive mammary neoplasms distinguished by high histological grade, marked cellular pleomorphism and negative ER estimation. Hormone dependent phenotype is reflected by the negative ER expression status along with partial PR positivity indicating poor prognosis and reduced response to therapy. The loss of ER expression is associated with high grade malignant mammary neoplasms and correlate with increased invasiveness and metastatic potential. These observations underscore the importance of histopathological and immunohistochemical profiling for

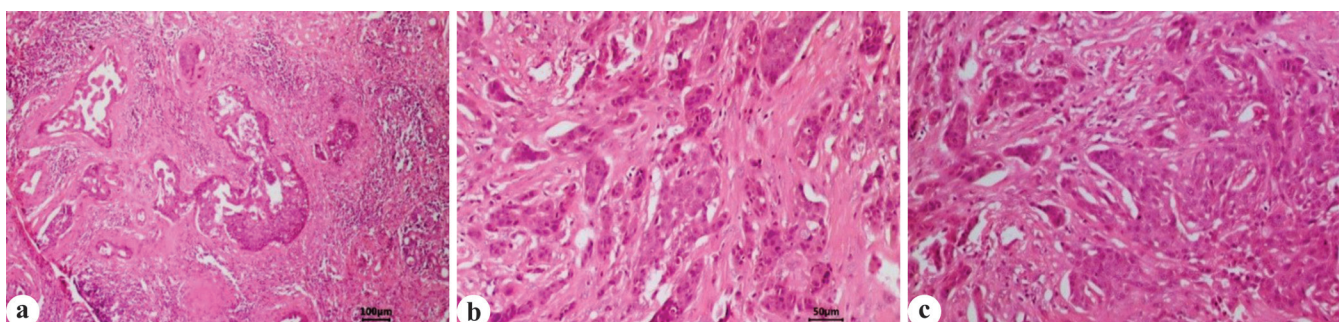


Fig. 4a. Infiltrative nests of tumor cells forming lobular patterns surrounded by inflammatory cells (H&E x100). **b & c.** Neoplastic epithelial cells either singly or forming tumour islands, distributed irregularly in stromal component without tubule formation with high grade nuclear atypia, marked pleomorphism with frequent mitotic figures (H&E x200).

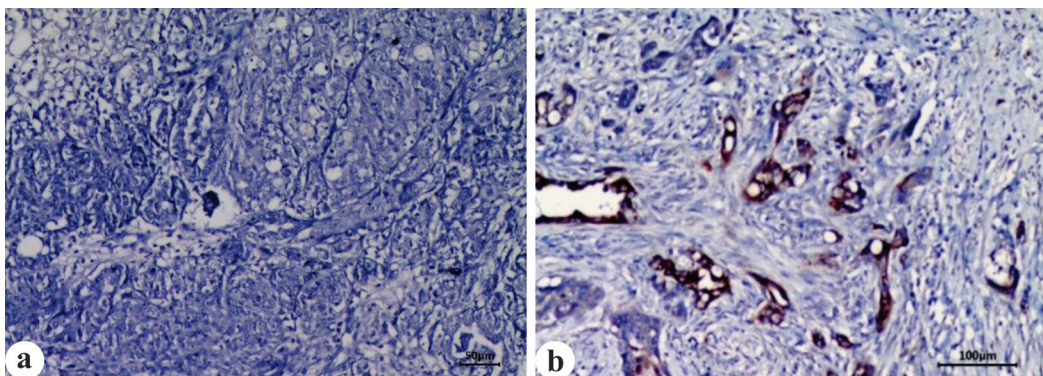


Fig. 5a. Nests of epithelial cells showing bluish hematoxylin counter stain only in tissue sections immunostained for ER. **b.** Moderate nuclear immunostaining for PR in the epithelial cells (DAB x Meyer's hematoxylin x100).

neoplasms classification as well as to define the prognosis of the case and personalized therapeutic strategies. The dog died after three months of surgical excision of the tumour.

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