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THE INFORMATIVE VALUE OF HISTOMORPHOLOGICAL EXAMINATION OF MAMMARY GLAND NEOPLASIA FOR PREDICTING METASTASIS IN DOGS AND CATS

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Summary. Significant morphological diversity and varying degrees of metastatic potential have been demonstrated in mammary tumors in dogs and cats. Histomorphological verification is a key step in determining the biological behavior of neoplasms. A statistically significant association has been demonstrated between clinical stage, as defined by the TNM system, and histological malignancy of tumors. Malignant neoplasms are significantly more often associated with advanced stages of the disease and the presence of metastases. Regional lymph node involvement and distant metastasis are decisive prognostic criteria. Benign tumors predominantly correspond to early stages and show no signs of metastatic growth. This study demonstrates the feasibility of using χ^2 and Fisher's criteria to analyze small samples in veterinary oncology studies. The metastatic potential of a tumor is emphasized as having greater prognostic significance than the size of the primary tumor. A comprehensive approach that takes into account clinical and morphological parameters is shown to improve the accuracy of predicting disease progression. The need for further research using standardized methods and larger samples to advance knowledge in veterinary oncology is emphasized

Keywords: histomorphological identification, TNM stratification, metastatic potential, prognostic factors

Introduction. Approximately 200 scientific papers on mammary tumors in cats have been published since the First Symposium on Mammary Neoplasia in Dogs and Cats was held at the Ninth Annual Congress of the British Small Animal Veterinary Association in London in 1966 (Guirguis and Beggs, 2025). Mammary tumors are common in cats and account for approximately 17% of all neoplasms in these animals. Most of them are hormone-independent carcinomas (80–90%) of the simple type (involving a single neoplastic cell component — the ductal epithelium), which are characterized by aggressive biological behavior (Rodrigues-Jesus et al., 2025).

It is reported that the metastasis rate ranges from 50% to 90%, with regional lymph nodes (83%), lungs (83%), liver (25%), and pleura being the most commonly affected sites (Vazquez et al., 2023). The median survival time after initial tumor detection in untreated cats is approximately 12 months, although it varies depending on the clinical stage following tumor removal (Barbagianni and Gouletsou, 2023).

The clinical, pathomorphological, and molecular characteristics studied to identify prognostic indicators and therapeutic prognostic markers for mammary tumors in cats include: disease stage (based on tumor size, lymph node status, and the presence of metastases); histological grade of malignancy; molecular markers, such as cell cycle proteins, estrogen and progesterone receptors (ER and PR), and the epidermal growth factor receptor 2 (HER-2) (Feliciano et al., 2023).

In addition, numerous retrospective studies indirectly link the prognostic role of the parameter under study to already known prognostic factors (e. g., grade of malignancy). This approach does not allow for an accurate assessment of whether the parameter under study directly affects tumor progression and the outcome. Approximately 3% of all studies are dedicated to the study of therapeutic prognostic markers. Furthermore, most prognostic factors were evaluated using univariate analysis (e. g., Kaplan–Meier curves). Multivariate analysis is often either absent or results in the loss of statistical significance of the studied parameter (Zhelavskyi and Dmytriv, 2023).

A detailed review of the literature on mammary tumors in cats was conducted, evaluating various proposed prognostic parameters in accordance with the recently published Recommended Guidelines for the Conduct and Evaluation of Prognostic Studies in Veterinary Oncology (Webster et al., 2010). These principles reflect the current consensus among veterinary pathologists and oncologists regarding the evaluation of the most important prognostic factors in animal neoplasms. Based on these criteria, statistically significant prognostic parameters were identified, and recommendations for predicting disease progression were formulated (Pastor et al., 2022).

The median age at which mammary tumors develop in cats is 10–12 years, with an increased risk up to 14 years of age. Carcinomas are more common in older cats than benign tumors. Although there is evidence of a poorer prognosis in older animals, the results remain inconclusive. The age threshold of 10 years was not associated with recurrence, recurrence-free interval, or lifespan. Age also had no significant effect on 1- and 2-year survival after surgery and is generally not considered an independent prognostic factor. At the

same time, one study found an association between age and survival; however, the large number of variables (n = 35) reduced the statistical power of the analysis, and the data collection methods remained insufficiently described (Hillaert et al., 2022). In some studies, older age was associated with shorter survival based on univariate analysis, but this association lost significance in multivariate analysis (Massimini et al., 2022).

Although mammary tumors most commonly occur in female cats, they have also been reported in males, and their aggressiveness is similar to that in females. No difference in tumor behavior has been observed between spayed and unspayed animals. However, spaying before 6 months of age and before 1 year of age reduces the risk of tumor development by 91% and 86%, respectively. An increased risk is also associated with long-term use of progestins (Choi et al., 2022).

Siamese cats have an increased risk of developing mammary carcinomas and are more likely to develop the disease at a younger age (up to 9 years) compared to other breeds (up to 14 years). They also more frequently develop invasive tumor forms, including micropapillary carcinoma. However, reliable data on disease incidence by breed are limited (Yitbarek and Dagnaw, 2022). Long-haired breeds (Siamese and Persian) showed a poorer prognosis in univariate analysis, but this effect was not confirmed in multivariate analysis. Overall, breed is not considered an independent prognostic factor (Koo et al., 2022). Unfortunately, only about 15% of the studies included clinical data from follow-up observations, and almost all of these were retrospective. Thus, recurrence-free survival, one of the most important predictors of clinical behavior, was often not assessed. Recurrence-free survival is the time from surgery to the development of recurrence and/or metastasis. Furthermore, the methods used to collect follow-up data are often unclear, and the number of cases included is typically small (15–65 animals in studies published after 1990) (Greco et al., 2023).

Mammary tumor staging in cats is based on the TNM system, which is widely used in clinical practice despite certain differences in its application. However, there is significant variability in tumor measurement methods and lymph node assessment, highlighting the need to standardize this system (Klaengkaew et al., 2021).

Staging is not always included in studies because information on tumor size or the presence of distant metastases is often lacking. Therefore, these indicators are often analyzed separately. Nevertheless, the prognostic significance of clinical stage has been confirmed; survival decreases significantly as the disease stage increases. However, stage does not always remain an independent prognostic factor in multivariate analysis (Petrucci et al., 2021).

Histologically confirmed lymph node metastases are an independent prognostic factor associated with reduced overall survival (less than nine months) (Soultani et al., 2021). Compared to more conservative interventions, radical mastectomy in cats without distant metastases provides a longer recurrence-free period (Moraes and Borges, 2021), although these differences are not always confirmed in multivariate analysis (Hart et al., 2020).

Tumor size is an important prognostic factor included in the TNM system (Rose and Worley, 2020). In most studies, tumor size was assessed as a continuous variable; however, the methods used to measure it are often not described (Stan et al., 2020). Tumor volume also correlates with survival; however, it is tumor diameter that remains an independent prognostic indicator in multivariate analyses (Sánchez et al., 2019).

Changes are also occurring in the nosological structure of mammary tumors in dogs. Numerous studies and various approaches to morphological diagnosis have sparked discussions about their classification (Tanaka et al., 2020).

Thus, mammary tumors in cats are among the most common neoplasms and are characterized by high malignancy and a high rate of metastasis. Most of them are aggressive carcinomas, which result in a relatively short survival time for the animals after diagnosis. It has been established that key prognostic factors include tumor size, the presence of metastases (especially in lymph nodes), and surgical treatment strategy.

Clinical staging according to the TNM system is of great importance, but its prognostic value is not always confirmed in multifactorial models. At the same time, molecular and histological markers are considered promising prognostic tools, but their role requires further clarification. The age and breed of animals do not have a clear impact on prognosis, although some studies indicate certain associations. There is also an evolution in classifications and approaches to morphological diagnosis, reflecting the development of veterinary oncology. However, the following issues have been identified:

— lack of prospective studies — most publications are retrospective in nature, which reduces the reliability of the conclusions;

— small sample size — in many studies, the number of cases is limited, which affects the statistical significance of the results;

— incomplete clinical data — information on staging, metastasis, or follow-up is often missing;

— lack of standardization — different methods for assessing tumor size, lymph node status, and the application of the TNM system make it difficult to compare results;

— limited use of multifactorial analysis — a significant portion of the conclusions is based solely on univariate methods, which may distort the true prognostic value of the factors;

— uncertainty regarding the role of individual factors — such as age, breed, and hormonal status — due to conflicting results;

— insufficient study of molecular markers — despite their potential, only a small fraction of studies is devoted to their prognostic significance;

— controversy surrounding classifications — the lack of a unified approach to the morphological classification of tumors complicates the standardization of diagnosis and prognosis.

Based on this, it can be concluded that despite a significant number of studies, current knowledge about mammary tumors in cats and dogs remains fragmented. Further progress in this field requires standardized approaches and larger prospective studies aimed at predicting metastasis and oncological stratification of affected animals.

In light of the above, our **aim** is to evaluate the prognosis of breast tumor metastasis in dogs and cats based on histomorphological verification results.

Materials and methods. The study material consisted of biopsied samples of mammary gland neoplasms obtained from dogs and cats of various ages and breeds that were referred for surgical treatment to the veterinary clinic 'Dovira' veterinary clinic (Kharkiv, Ukraine). The prospective study included 10 dogs and 10 cats with clinically diagnosed mammary gland tumors aged 6 to 17 years. In all cases, on the day before surgery, an assessment of the local tumor status and determination of the clinical stage of the disease according to the TNM system were performed.

Surgical treatment involved mastectomy (zonal in dogs or unilateral in cats) with mandatory dissection of regional lymph nodes. After removal of the neoplasms, biopsies were taken (tumor, adjacent tissues, lymph nodes), which were labeled according to the location and type of sample. The obtained biopsies were fixed in 10% neutral buffered formalin for 24–48 hours to ensure preservation of the morphological structure of the tissues. After fixation, the material underwent standard histological processing: dehydration in alcohols of increasing concentration and embedding in paraffin. Histological sections 4–5 μm thick were prepared from paraffin blocks using a rotary microtome. The sections were mounted on slides and stained with hematoxylin and eosin for subsequent light microscopic examination.

Microscopic examination was performed using a light microscope (× 400). The tumor architecture, cellular composition, degree of differentiation, mitotic activity, presence of necrosis, invasion into surrounding tissues and vessels, as well as the status of regional lymph nodes, were assessed.

The histomorphological classification of tumors was performed in accordance with generally accepted criteria, determining the type of neoplasm (benign or malignant) and the degree of differentiation (G1–G3). The results were compared with the clinical stage of the disease according to the TNM system to establish a correlation between the clinical and morphological characteristics of mammary tumors in dogs and cats.

All manipulations with experimental animals were carried out in accordance with the 'European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes' (CE, 1986) and Council Directive 2010/63/EU (CEC, 2010), and under Art. 26 of the Law of Ukraine No. 3447-IV of 21.02.2006 'About protection of animals from cruel treatment' (VRU, 2006) and basic bioethical principles (Simmonds, 2017). Under the current procedure, the research program was reviewed and approved by the Bioethics Committee of the State Biotechnology University.

Statistical analysis of the results in the experimental animal groups was performed using the χ^2 criterion and Fisher's exact test. These methods were used to assess the significance of differences between groups and to identify statistically significant associations between the studied parameters.

Results and discussion. Based on the analysis of medical history data from dogs and cats in the experimental groups, it was noted that some animals with mammary gland neoplasms had previously received hormonal medications to suppress estrus, suggesting an estrogen-dependent etiology of the neoplasms. Mammary gland neoplasms in dogs and cats were observed in various areas of the mammary gland without any specific localization.

An analysis of the veterinary clinic's medical records showed that cases of mammary gland tumors in dogs are being recorded with increasing frequency. Of 20 mammary gland tumors, histomorphological studies confirmed that only 6 were benign (30%).

It should be noted that the incidence of malignant mammary gland tumors in the study group of dogs was 60% (6 cases), with a mean age of 9.5 years, while the incidence of malignant mammary tumors in the study group of cats was 80% (8 cases), and the average age was 9.4 years. This suggests that the progression of mammary tumors depends on the age of the animals.

The results of the analysis of the postoperative period and follow-up of animals after zonal or unilateral mastectomy indicate that the most effective approach is simultaneous mastectomy with regional lymph node dissection and hysterovarioectomy. Clinical observation of the animals over the course of a year revealed the following: tumor recurrence and distant metastasis within the first three months after surgery were detected in animals diagnosed with poorly differentiated carcinomas (G3) or carcinosarcomas, while other malignant tumors metastasized within 3–6 months to either the contralateral mammary gland or the nearest lymph nodes. Inguinal and axillary lymph nodes were palpable as hardened masses during examination.

Regarding benign lesions, it should be emphasized that no recurrences were recorded during the observation period; only one animal showed inflammation and induration of the inguinal lymph node. The results of the studies indicate that the surgical treatment of cats and dogs with mammary gland tumors via zonal or unilateral mastectomy with lymph node removal reduces the incidence of postoperative recurrence and the occurrence of inflammation and induration of lymph nodes, unlike the removal of the tumor alone without lymphadenectomy.

We have detailed the relationship between the clinical stage of mammary gland neoplasms and their histomorphological features in the experimental dogs (Table 1).

Table 1 — The relationship between the clinical stage of mammary gland tumors and their histological verification in dogs

The animal's name and age	Clinical stage by TNM	Histological diagnosis
Texas, 10 years old	$T_2N_0M_0$	Well-differentiated breast carcinoma (G1)
Businka, 10 years old	$T_1N_0M_0$	Simple breast adenoma
Gina, 7 years old	$T_1N_0M_0$	Mixed benign breast tumor
Kapa, 10 years old	$T_3N_1M_1$	Solid breast carcinoma with metastatic spread to a regional lymph node
Lusia, 10 years old	$T_1N_0M_0$	Simple, well-differentiated breast carcinoma (G1)
Pusha, 9 years old	$T_1N_0M_0$	Ductal carcinoma of the breast; lymph node with no signs of metastatic growth
Tina, 11 years old	$T_1N_0M_0$	Mixed benign breast tumor
Faya, 17 years old	$T_3N_0M_0$	Soft tissue sarcoma, complex breast adenoma, breast carcinoma, well-differentiated (G1)
Funia, 11 years old	$T_1N_0M_0$	Benign complex breast tumor
Hasya, 11 years old	TNM	Well-differentiated simple breast carcinoma (G1)

Thus, the mammary gland neoplasm in the male dog named 'Texas' is encapsulated, round in shape, measuring 7×6 cm, with clear borders, and localized in the projection of the 5th pair; the right inguinal lymph node is enlarged; the surrounding tissue is normal. Histomorphological verification was performed on biopsy specimens removed by excision, which were appropriately labeled. Analytical macroscopic description: 1k — a gray-colored skin lesion measuring 4.3×3.8 cm, with a hypodermis thickness of 1.4 cm. A 0.5×0.4 cm area of indentation, 0.3 cm deep, is visible on the surface. On sectioning, a gray-colored nodule measuring 2.0×1.6×1.5 cm. The resection margins are marked with black dye; 2k — a lymph node measuring 5.0×4.8×2.0 cm with a small amount of fatty tissue. Microscopic description: Microscopically, a well-defined formation is observed, composed of tubular structures lined with epithelial cells. The cells range in shape from rounded and oval to polygonal. They have well-defined borders and a small amount of eosinophilic cytoplasm. Nuclei are oval, normochromic or hyperchromic, with granular chromatin and a central nucleolus. Anisocytosis and anisokaryosis range from moderate to marked. Mitotic activity is up to 4–6 mitoses per 10 high-power fields. A large number of dilated ducts filled with eosinophilic contents are present. The stroma is moderate, containing lymphocytic-plasmacytic infiltrates. Necrotic areas are present. The slides show normal adipose tissue under the microscope. Histomorphological diagnosis: well-differentiated breast carcinoma (G1).

From the pathological material removed from a female dog named 'Businka': left inguinal lymph node, 5th pair of mammary glands on the left, and a morphologically unchanged cranial mammary gland. The lymph node is slightly enlarged, adherent to the subcutaneous tissue; the tumor is an encapsulated formation, up to 5 mm in diameter, rounded; the cranial mammary gland with nipple is unchanged. No changes in tissues or organs adjacent to the lesion are identified. The material, appropriately labeled, was obtained during a lateral mastectomy and lymph node dissection. Macroscopic description: 1k — 2 gray-colored tissue fragments with a total size of 2×2×0.7 cm; 2k — a gray-colored skin flap, measuring 2.6×1.7×0.4 cm. A dome-shaped, gray-colored formation measuring 1×0.8×0.5 cm with a finely nodular surface is visible on the surface. A nodular formation measuring 0.5×0.5×0.4 cm is visible on the section. The resection margins are marked with blue dye; 3k — a gray skin excision, measuring 0.9×0.9×0.4 cm. On the surface, a dome-shaped formation is observed, gray in color, measuring 0.7×0.5×0.4 cm, with a finely nodular surface. The resection margins are marked with blue dye. Microscopic description: Microscopically significant changes are present only near the nipple. A well-defined lesion is observed; it has sclerotic changes in the center and consists of tubular structures lined with epithelial cells. The cells are oval and polygonal in shape, with well-defined borders, sparse eosinophilic cytoplasm, an oval nucleus, granular or open chromatin, moderate anisocytosis and anisokaryosis, and sporadic mitoses. Portions of a lymph node characterized by follicular hyperplasia are observed in the adipose tissue. Histomorphological diagnosis: simple breast adenoma.

A neoplasm in a female dog named 'Gina' is located in the area of the second mammary gland, is encapsulated, measures 7×4 cm, is non-invasive, has an irregular oval shape, and the surrounding tissues are unchanged. Histomorphological verification was performed on biopsy specimens removed by excision, which were appropriately labeled. Macroscopic description: 1k — a gray-colored skin flap measuring 4.0×3.0 cm, with a hypodermis thickness of 3.0 cm. A dome-shaped, gray-colored formation measuring 0.8×0.7×0.7 cm with a finely nodular surface is visible on the surface. On sectioning, a dense, nodular, gray-colored formation measuring 4.0×3.5×3.0 cm is visible. The resection

margins are marked with black dye. Microscopic description: The specimen consists of hairy skin containing an intradermally demarcated lesion composed of three components — epithelial, myoepithelial, and mesenchymal. The epithelial component consists of tubules lined with epithelial cells; the cells are columnar, with moderately defined eosinophilic cytoplasm, an oval normochromic nucleus, granular or open chromatin, and a central nucleolus. Anisocytosis and anisokaryosis are not pronounced Mitoses are sporadic. The myoepithelial component consists of spindle-shaped cells with indistinct eosinophilic cytoplasm, reticulated chromatin, and a central nucleolus. Anisocytosis and anisokaryosis are minimal. No mitotic figures are observed. The cells are embedded in an extracellular basophilic matrix. The mesenchymal component is represented by cartilage. Histomorphological diagnosis: mixed benign tumor of the breast.

A tumor on the mammary gland, collected from a dog named 'Kapa', is encapsulated and oval in shape; the surrounding tissues are normal. Macroscopic description: 1k — 5 irregularly shaped tissue fragments, ranging in size from 2×2×0.7 cm (without skin) to 2.5×2×1.8 cm. Four of them are partially covered with skin; one has a nipple. All fragments are irregular in shape. The subcutaneous tissues are dense; in 3 of them, they form whitish nodules. Microscopic description: Hairy skin is present; intradermally, there is a non-encapsulated, ill-defined, infiltrative formation consisting of solid, irregular islands of neoplastic cells. Cells range in shape from rounded and oval to polygonal. They have well-defined borders and a small amount of eosinophilic cytoplasm. Nuclei are oval, clear, with deep chromatin and a central nucleolus. Anisocytosis and anisokaryosis range from moderate to marked. Mitotic activity is approximately 50 mitotic figures per 10 high-power fields. The stroma is markedly reactive, infiltrated with plasma cells and lymphocytes, and contains reactive fibroblasts. The lymph node contains a carcinoma metastasis. Histomorphological diagnosis: solid breast carcinoma with metastatic spread to a regional lymph node.

A neoplasm of the fifth mammary gland on the left side, excised from a dog named 'Lusia'; it is round, firm, and small in size; the surrounding tissues are unaltered. Following a regional mastectomy, the following histomorphological findings were obtained from the labeled biopsy specimens. Macroscopic description: 1k — 5 fragments of gray-brown tissue, partially covered by skin, with a total size of 4.5×3.0×1.5 cm; on sectioning, areas of induration are observed in the dermis and adjacent tissues; marking is not possible due to fragmentation. Microscopic description: A mammary gland structure is present, multilobular, and relatively well-defined. Composed of tubular and papillary structures lined with epithelial cells. Cells range in shape from rounded and oval to polygonal. They have well-defined borders and a small amount of eosinophilic cytoplasm. Nuclei are oval, normochromic, with deep chromatin and a central nucleolus. Anisocytosis and anisokaryosis range from moderate to marked. Mitotic activity is approximately 6–7 mitotic figures per 10 high-power fields. A large number of dilated ducts filled with eosinophilic or amphophilic contents are present. The stroma is moderate and contains lymphocytic-plasmacytic infiltrates. Necrotic areas and marked neutrophilic infiltration are present. Structures of regular lobular hyperplasia are present around the lesion. Histomorphological diagnosis: breast carcinoma, simple, well-differentiated (G1).

During a mastectomy performed on a dog named 'Pusha', the following labeled biopsy specimens were obtained: specimen 1 — tumor, caudal mammary gland; specimen 2 — inguinal lymph node. The tumor is cluster-like, consisting of encapsulated round nodules that are firm to the touch. Lymph node: size and shape are normal. Surrounding tissues show no noticeable morphological changes. Macroscopic description: 1k — gray tissue fragments with a total size of 2.7×1.9×1.2 cm. Resection margins cannot be marked due to prior fragmentation; 2k — gray tissue fragments with a total size of 3.8×2.4×1.3 cm. The resection margins cannot be marked due to prior fragmentation. Microscopic description: a mammary gland structure is present, unencapsulated, multilobular, consisting of tubular structures with ductal differentiation (filled with keratin). Cells range in shape from rounded and oval to polygonal. They have well-defined borders and a small amount of eosinophilic cytoplasm. Nuclei are oval, hyperchromatic, with deep chromatin and a central nucleolus. Anisocytosis and anisokaryosis range from moderate to marked. Mitotic activity is approximately 35–40 mitotic figures per 10 high-power fields. Stroma is moderate. Enlarged ducts filled with eosinophilic contents are present. Microscopically, normal adipose tissue and a lymph node without signs of metastatic growth are present. Histomorphological diagnosis: ductal carcinoma of the breast, lymph node without signs of metastatic growth.

The specimen collected from a dog named 'Tina' consisted of a mammary gland with a localized, encapsulated, homogeneous, oval-shaped mass. The surrounding tissues were not affected. Macroscopic description: 1k — skin flap fragments with overall dimensions of 5.5×4.0×1.0 cm. Dome-shaped formations measuring 0.3×0.3×0.2 cm and 0.5×0.4×0.3 cm are visible on the surface. Within the thickness of one of the fragments, a mass measuring 2.0×1.6×0.5 cm is identified; it cannot be marked due to the fragmentation of the pieces. Microscopic description: In the dermis, there is an encapsulated formation consisting of three components: epithelial, myoepithelial, and mesenchymal. The epithelial component consists of tubules lined with epithelial cells; the cells are columnar, with moderately defined eosinophilic cytoplasm, an oval normochromic nucleus, granular or open chromatin, and a central nucleolus. Anisocytosis and anisokaryosis are not pronounced. Mitoses are sporadic. Slightly dilated ducts

with eosinophilic or amphophilic contents are present. The myoepithelial component consists of spindle-shaped cells with indistinct eosinophilic cytoplasm, reticulated chromatin, and a central nucleolus. Anisocytosis and anisokaryosis are minimal. No mitotic figures are observed. The cells are embedded in an extracellular myxoid matrix. The mesenchymal component is represented by cartilage. Histomorphological diagnosis: mixed benign tumor of the breast.

The material for histological examination, collected during a mastectomy performed on a dog named 'Faya', consisted of a large, dense mammary gland mass and a right inguinal lymph node. The surrounding tissues were edematous. Macroscopic description: 1k — fragments with a total size of 5.7×5.0×0.4 cm. On sectioning of some fragments, a nodular gray-colored mass is identified, ranging in size from 0.8 to 1.5 cm; 2k — fragments with a total size of 4.0×3.0×0.4 cm. Microscopic description: a section is presented containing a non-encapsulated, ill-defined, infiltrative mass consisting of irregular, disorganized bundles and streams of neoplastic cells, spindle-shaped, with indistinct borders of scant eosinophilic cytoplasm, round or oval, large, somewhat clear nuclei, reticulated chromatin, and prominent purple nucleoli (1–3). Anisocytosis and anisokaryosis are pronounced; mitoses are frequent. The lesion contains large necrotic areas. Microscopically, it represents a mammary gland lesion consisting of two components — epithelial and myoepithelial. The epithelial component consists of tubules and papillary structures lined with epithelial cells; the cells are columnar, with moderately defined eosinophilic cytoplasm, an oval normochromic nucleus, granular or open chromatin, and a central nucleolus. Anisocytosis and anisokaryosis are not pronounced. Mitoses are sporadic. Slightly dilated ducts with eosinophilic or amphophilic contents are present. The myoepithelial component consists of spindle-shaped cells with indistinct eosinophilic cytoplasm, reticulated chromatin, and a central nucleolus. Anisocytosis and anisokaryosis are minimal. No mitotic figures are observed. The cells are embedded in an abundant basophilic extracellular myxoid matrix. Structures of regular lobular hyperplasia are present around the lesion. Microscopically, altered breast tissue is present, characterized by the growth of epithelial neoplastic cells forming tubules and papillary growths with ductal differentiation (filled with keratin). The neoplastic cells are rounded, with hyperchromatic nuclei, granular chromatin; anisocytosis and anisokaryosis are moderately pronounced; mitotic activity is up to 20 mitotic figures per 10 high-power fields. Histomorphological diagnosis: soft tissue sarcoma, complex breast adenoma, breast carcinoma, well-differentiated (G1).

A round-shaped breast neoplasm, firm to the touch and mobile on palpation, was obtained during a mastectomy performed on a dog named 'Funya' and sent for histomorphological examination. The surrounding tissues are unaltered. Macroscopic description: 1k — a skin flap measuring 1.5×1.5×1.2 cm. On sectioning, a round formation with clear borders, 0.5 cm in diameter, is visible in the dermis and has been marked. Microscopically, the formation is relatively well-defined and consists of two components intermingled with each other. The epithelial component consists of tubules lined with epithelial cells; the cells are columnar, with moderately defined eosinophilic cytoplasm, an oval normochromic nucleus, granular or open chromatin, and a central nucleolus. Anisocytosis and anisokaryosis are not pronounced. Mitoses are sporadic. Slightly dilated ducts with eosinophilic or amphophilic contents are present. The myoepithelial component consists of spindle-shaped cells with indistinct eosinophilic cytoplasm, reticulated chromatin, and a central nucleolus. Anisocytosis and anisokaryosis are minimal. No mitotic figures are observed. The cells are embedded in an extracellular basophilic myxoid matrix. Histomorphological diagnosis: complex benign breast tumor.

A mammary gland neoplasm in a dog named 'Hasya' was located in the region of the third pair of mammary glands; it was oval in shape, heterogeneous, and encapsulated. The surrounding tissues were unaltered. Microscopic description: 1k — a gray skin flap measuring 3.8×3.3 cm, with a hypodermis thickness of 1.9 cm. A dome-shaped, gray formation measuring 0.8×0.5×0.5 cm with a finely nodular surface is visible on the surface. On sectioning — a dense, nodular, gray-colored formation measuring 4.0×3.0×1.5 cm with a cavity filled with liquid white contents. The margins of the resection are marked with black dye. Microscopically, hairy skin with a nipple is observed; intradermally, extending into the hypodermis, there is an encapsulated formation consisting of tubular and solid structures (islands, solid shields) lined with epithelial cells. Cells range in shape from rounded and oval to polygonal. They have well-defined borders and a small amount of eosinophilic cytoplasm. Nuclei are oval, hyperchromatic, with deep chromatin and a central nucleolus (areas containing large, vacuolated epithelial cells are present). Anisocytosis and anisokaryosis are moderately pronounced. Mitotic activity is approximately 15–20 mitotic figures per 10 high-power fields. Dilated ducts filled with amphiphilic contents are present. The stroma is moderate and contains lymphocytic-plasmacytic infiltrates. Areas of necrosis are present. The lesion appears to have been completely excised. Histomorphological diagnosis: well-differentiated simple breast carcinoma (G1).

Concerning neoplastic processes in cats, we have demonstrated the following correlation between the clinical stage of mammary gland tumors and their histological findings (Table 2).

Thus, during a unilateral mastectomy performed on a cat named 'Anfisa', the right mammary glands were removed, including morphologically normal tissue, and a lymph node dissection of the inguinal and axillary lymph nodes was performed.

Table 2 — The relationship between the clinical stage of breast tumors and their histological confirmation in cats

The animal's name and age	Clinical stage by TNM	Histological diagnosis
Anfisa, 9 years old	$T_2N_0M_0$	Tubular, well-differentiated breast carcinoma without evidence of metastatic spread to the lymph nodes (G1)
Bagira, 8 years old	$T_1N_0M_1$	Simple tubular breast carcinoma, poorly differentiated (G3)
Baron, 11 years old	$T_2N_0M_0$	Simple tubular breast carcinoma (G1)
Jaima, 11 years old	$T_2N_1M_0$	Comedocarcinoma of the breast with metastasis to a lymph node
Leia, 7 years old	$T_1N_0M_0$	Simple carcinoma of the breast
Nika, 11 years old	$T_3N_1M_1$	Osteosarcoma of the breast
Plyusha, 11 years old	$T_3N_0M_0$	Apocrine ductal adenoma, follicular hyperplasia of a lymph node
Pusha, 6 years old	$T_3N_0M_0$	Fibroadenomatous changes in the breast; a lymph node with follicular hyperplasia
Sonya, 10 years old	$T_3N_1M_0$	Carcinoma with neoplastic lymph node invasion
Helga, 10 years old	$T_3N_1M_0$	Solid breast carcinoma with metastatic spread to a regional lymph node

All pathological material was labeled: specimen 1 — mammary gland tumor, specimen 2 — lymph nodes (inguinal and axillary). Macroscopic description: 1k — a gray skin excision measuring 2.5×0.5 cm, with a hypodermis thickness of 1.3 cm. On section — an area of gray induration. The resection margins are marked with black dye; 2k — two fragments with a total size of 3.4×2.9×1.0 cm. On sectioning, a gray-colored nodule measuring 0.3×0.2×0.1 cm. Microscopically, a relatively well-defined mammary gland formation is observed, located within a dense stroma. It is composed of tubular structures lined with epithelial cells. Cells range in shape from rounded and oval to polygonal. They have well-defined borders and a small amount of eosinophilic cytoplasm. Nuclei are oval, hyperchromatic, with deep chromatin and a central nucleolus. Anisocytosis and anisokaryosis range from moderate to marked. Mitotic activity is approximately 25 mitotic figures per 10 high-power fields. Dilated ducts filled with eosinophilic contents are present. There is no vascular invasion; the lesion appears completely excised. There are no signs of metastatic growth in the lymph nodes. Histomorphological diagnosis: breast carcinoma, tubular, well-differentiated, with no signs of metastatic growth in the lymph nodes (G1).

A histological examination was performed on a neoplasm located at the level of the second–third mammary gland pair on the left side of a cat named 'Bagira', measuring 8.0–10.0 cm, which exhibited local ulcerative foci. Examination was also performed on a lymph node obtained following lymph node dissection. The samples were labeled as follows: 1 — mammary gland neoplasm (recurrence at the necrosis stage); 2 — axillary lymph node. Macroscopic description: 1k: a soft tissue fragment measuring 5.5×4.0×3.0 cm consisting of a skin flap measuring 5.5×4.0 cm with a bumpy, whitish-grey surface and a subcutaneous, nodular, firm-elastic mass measuring 5.0×3.5×2.3 cm. This mass was partially cut, firm-elastic in consistency, and grey in colour, with necrotic cavities throughout. 2k: a soft tissue fragment measuring 5.0×4.0×2.8 cm presented as a sectioned nodule of whitish-grey colour with an elastic consistency and a cavity of decay. Microscopically, it contains areas of hairy skin with mammary gland formation. The neoplasm is not encapsulated and has no defined borders. It consists of tubular structures lined with epithelial cells. The cells range in shape from rounded and oval to polygonal. They have well-defined borders and a small amount of eosinophilic cytoplasm. Nuclei are oval, hyperchromatic, with deep chromatin and a central nucleolus. Anisocytosis and anisokaryosis range from moderate to marked. Mitotic activity is approximately 70 mitotic figures per 10 high-power fields. The stroma is moderate, abundantly infiltrated with neutrophils. Large necrotic areas are present centrally and around the neoplastic structures. The structure of the lesion is morphologically similar to the previous one; however, lymphoid follicles are present nearby, but they lie outside the tissue, so likely that this neoplasm is completely displaced by lymph node carcinoma structures. Histomorphological diagnosis: simple tubular carcinoma of the breast, poorly differentiated (G3).

During the mastectomy of a cat named 'Baron', which was performed due to the presence of a round-shaped, 1×1 cm, encapsulated neoplasm that was non-invasive to the surrounding tissues, two tissue samples were collected. The first specimen consists of dense, elastic, whitish-gray tissue, measuring 5×4×4 mm. The second is a skin fragment measuring 1.2×1.0 cm, 3 to 7 mm thick; the skin surface is unchanged; on sections, an intradermal formation is visible in the form of a dense nodule of heterogeneous gray-brown color. Microscopically, a relatively well-defined mammary gland formation is observed. It is composed of tubular structures lined with epithelial cells. The cells range in shape from rounded and oval to polygonal. They have well-defined borders and a small amount of eosinophilic cytoplasm. Nuclei are oval, hyperchromatic, with deep chromatin and a central nucleolus. Anisocytosis and anisokaryosis are moderate. Mitotic activity is up to 8–10 mitotic figures per 10 high-power fields. Dilated and markedly dilated ducts filled with eosinophilic contents

are present. Histomorphological diagnosis: simple tubular carcinoma of the breast (G1).

Histological material from the cat 'Jaima', obtained during a mastectomy, has been divided into two samples: No. 1 — mammary gland neoplasm, No. 2 — axillary lymph node. Multiple lesions on the mammary glands. The largest is up to 3.0 cm in diameter and is located at the level of the first mammary gland on the right. Lesions on the 3rd–5th mammary glands up to 1.0 cm; enlarged right axillary lymph node. Macroscopic description: 1k — a 4.5×4.5 cm irregularly shaped skin fragment with subcutaneous tissue ranging from 0.5 to 1.5 cm, with multiple parallel incisions to the skin; on the incisions, a subcutaneous nodular mass of dense consistency, whitish-gray in color, with clear borders, measuring 2.2×2.0×1.3 cm; 2k — a nodular formation measuring 1.5×1.2×0.5 cm, representing an opened cystic formation with a cavity measuring 0.8×0.6×0.3 cm, with whitish walls ranging from 0.1 to 0.3 cm. Lesions are characterized by the formation of fairly large aggregates of densely packed cells containing large central foci of necrosis. The necrotic foci contain eosinophilic material. The tumor mass consists of densely packed aggregates of cells, predominantly in tubules. Tumor cells are round in shape, with a small amount of eosinophilic cytoplasm with distinct borders; the nuclei are large, round, hyperchromatic, and contain 1–3 nucleoli. Anisocytosis and anisokaryosis are pronounced. Mitotic activity is increased, with an average of 3–4 mitotic figures per high-power field. The lymph node contains carcinoma structures. Histomorphological diagnosis: comedocarcinoma of the breast with metastatic spread to a lymph node.

The histological specimens collected during a mastectomy from a cat named 'Leia' are labeled as follows: specimen 1 — right inguinal lymph node; specimen 2 — tissue from the caudal mammary gland; specimen 3 — cranial mammary gland; specimen 1 — vesicles on the lymph node, enlarged in size; specimen 2 — a neoplasm of the caudal lymph node, up to 3 cm in diameter, rounded, with clear borders and a capsule; specimen 3 — morphologically unchanged nipple and mammary gland (cranial). Bubbles are visualized in the subcutaneous tissue and around the neoplasm and lymph node, with inflammation of the subcutaneous fat. Macroscopic description: 1k — a gray tissue fragment measuring 1.9×1.7×1.0 cm. On sectioning — a gray-colored nodule measuring 1.0×0.9×0.7 cm; 2k — gray-colored tissue fragments with a total size of 4.0×3.5×1.0 cm. On sectioning of the fragments, areas of gray-colored induration are identified. The resection margins cannot be marked due to prior fragmentation; 3k — a gray-colored skin flap measuring 2.2×1.3 cm, with a hypodermis thickness of 0.3 cm. A gray, polypoid formation measuring 0.4×0.2×0.2 cm with a finely nodular surface is visible on the surface. The resection margins are marked with black dye. The dermis is present. A non-encapsulated, ill-defined neoplasm localized in the hypodermis, consisting of neoplastic epithelial-type cells arranged in tubular structures that form islands separated by septa of a thin fibroepithelial stroma. Cells range in shape from rounded and oval to polygonal. They have well-defined borders and a small amount of eosinophilic cytoplasm. Nuclei are oval, hyperchromatic, with deep chromatin and a central nucleolus. Anisocytosis and anisokaryosis range from moderate to marked. Mitotic activity is approximately 30 mitotic figures per 10 high-power fields. In the hypodermis, there is mammary gland formation similar to that described above; however, the islands are more massive, the nuclei are lighter, and mitotic activity is slightly higher, up to 35 mitotic figures per 10 high-power fields. Large necrotic foci and lymphoid follicles are noted at the periphery. Vascular invasion is observed. However, the nipple is not affected; structures of regular lobular hyperplasia are observed in the underlying tissue. Histomorphological diagnosis: simple breast carcinoma.

A large formation in the caudal mammary gland (the fifth pair on the right) of a cat named 'Nika' was sent for histological analysis. The neoplasm was found to be adjacent to local areas of erosion and necrosis, as well as disseminated small skin neoplasms in the region of the cranial mammary glands and hyperplasia of the axillary lymph node. Macroscopic description: 1k — two unmarked fragments. The first fragment is dense-elastic and partially spongy with a grey colour. It measures 3.0×3.0×3.3 cm and has an irregularly shaped skin flap measuring 2.5×2.0 cm. The edges of the fragment were stained blue during specimen preparation. The tissue section is divided into two compartments throughout its entire thickness. The second fragment consists of an irregularly shaped nodular formation measuring 3.5×2.0×2.4 cm, which is partially covered by a smooth grey capsule. The tissue structure is similar to that of the formation in the first fragment. Microscopically, hairy skin is visible. An unencapsulated, infiltrative, densely cellular formation is present intradermally. The neoplastic cells are pleomorphic and polygonal with sparse or moderate cytoplasm, a central round nucleus, reticulated chromatin and distinct nucleoli. The cells form disorganized bundles and streams. Anisocytosis and anisokaryosis are pronounced, with mitotic activity. Multifocal areas resembling osteoid are present. Multinucleated giant cells are also visible. Histomorphological diagnosis: osteosarcoma of the breast.

On palpation, a neoplasm in the mammary gland of a cat named 'Plyusha' is determined to be a non-invasive, encapsulated mass with a heterogeneous structure and well-defined borders. The surrounding tissues are unchanged. A mastectomy was performed. Macroscopic description: 1k — a gray-colored skin flap, measuring 3.4×2.4 cm, with a hypodermis thickness of 1 cm. On the surface, a dome-shaped, gray-colored mass measuring 2.7×2.3×0.9 cm with a finely nodular surface is identified. On section: a nodular gray-colored formation, measuring 2.7×1.6×1.4 cm, with small cavities filled with mucus. The resection margins are marked with blue dye; 2k is a gray skin excision measuring 4.2×2.8 cm, with a

hypodermis thickness of 1.3 cm. A dome-shaped, gray-colored formation measuring 3×2.5×0.6 cm with a finely nodular surface is visible on the surface. On the section — a nodular gray-colored formation measuring 3×2.5×1 cm, with small cavities filled with mucus. The resection margins are marked with blue dye; 3k is a gray tissue fragment measuring 3×2.5×1.7 cm. A nodular formation measuring 1.5×1.4×1.2 cm is visible on the surface. Focal, moderately well-defined, multinodular, non-encapsulated, cell-rich neoplastic proliferation is observed in the dermis, consisting of epithelial cells with a large central, predominantly optically empty lumen. The neoplastic cells range in shape from cubic to oval, forming solid areas and often small tubular structures, some of which appear to be lined by a double layer of cells and resemble the Arabic letters. At the center of a smaller number of solid formations are multifocal areas of necrosis. The collagenous stroma is thin. Neoplastic cells show moderate variation among themselves, have relatively little eosinophilic cytoplasm, and contain an oval or rounded nucleus with fine, clumped chromatin and an absent or barely visible, small nucleolus. Anisocytosis and anisokaryosis are mild or moderate. Up to 7–8 mitoses are present in 10 fields at the highest magnification (×400, 2.37 mm^2). Multiple foci within and around the tumor contain a slight to moderate number of lymphocytes and plasma cells. A lymph node with signs of follicular hyperplasia (marked) is present. Histomorphological diagnosis: apocrine ductal adenoma, follicular hyperplasia of the lymph node.

The lesion in the mammary gland of the cat named 'Pusha' is encapsulated, homogeneous, and localized at the level of the 4th pair; hypertrophy of the axillary lymph node is palpable. Macroscopic description: 1k — container labeled No. 1, containing a fragment of irregularly shaped adipose tissue, 2.3×1.0×0.6 cm, with a lymph node 0.8 cm in diameter within it; 2k — an irregularly shaped skin fragment measuring 5.0×3.0 cm with a subcutaneous fragment of a firm, elastic, whitish nodule measuring 4.0×3.5×2.5 cm, with a homogeneous structure on sections. Microscopic description: lymph node in a state of follicular hyperplasia; microscopically, there is proliferation of the stroma and fibroblasts. Fibroblasts are spindle-shaped, tailed, with minimal or moderate anisokaryosis. Some ducts are dilated and lined with epithelial cells; others are lined with several layers of epithelial cells showing moderate anisocytosis and anisokaryosis. The lesion is covered by hyperplastic epidermis; orthokeratosis is noted. Subepidermally, there is infiltration by inflammatory cells — lymphocytes and plasma cells — with occasional neutrophils and macrophages. Histomorphological diagnosis: fibroadenomatous changes in the breast; a lymph node in a state of follicular hyperplasia.

Histological examination of breast tumor samples obtained from a cat named 'Helga' was labeled as follows: Sample 1 — left inguinal lymph node; Sample 2 — breast tumor. The lymph node is mobile and enlarged; the mammary gland neoplasm is encapsulated, round in shape, up to 2 cm in size, surrounded by an area of diffuse edema. Macroscopic description: 1k — lymph node measuring 1.5×1.0×0.5 cm, with a small amount of fatty tissue; 2k — tissue fragments with a total size of 3.3×3.0×1.2 cm, including fragments of skin. Marking is not possible due to fragmentation. On sectioning of the fragments, a dense, nodular, gray-colored formation is identified, with a maximum diameter of 0.4 to 1.0 cm; 3k — gray-colored skin flap measuring 1.5×1.0×0.3 cm. A dome-shaped, gray-colored formation measuring 1.0×0.6×0.2 cm with a finely nodular surface is observed on the surface. The resection margins are marked with black dye. Microscopically, the lymph node is infiltrated by carcinoma structures. The structure of the mammary gland is shown microscopically. Neoplastic cells are densely packed into irregular lobules and surrounded by a delicate fibro-vascular stroma. The cells are arranged in clusters, masses, and strands, without any clear spaces. The cells are polygonal or oval, with well-defined borders of eosinophilic cytoplasm (in some cases, the borders are poorly visualized). The nuclei are rounded or oval, often vacuolated, with deep chromatin and a central basophilic nucleolus. Anisocytosis and anisokaryosis are pronounced. Mitotic activity averages 3–4 mitotic figures per high-power field. Dense lymphocytic infiltrates are present at the periphery of the lesion. A skin specimen is presented for microscopic examination. The epidermis is diffusely hyperplastic to a moderate to marked degree, forming exophytic papillary projections, and is covered with a moderate amount of lamellar or orthokeratotic keratin, ranging in appearance from lamellar to braided. The formation of broad ridges of the epidermis is observed. There are ulcerated areas with blood and crusting. The cells show marked dysplastic features. Cells are large, with large hyperchromatic or normochromatic oval nuclei and prominent nucleoli. Anisocytosis and anisokaryosis range from moderate to marked; mitotic activity is observed. Several 'keratin pearls' are multifocally visible. The biopsy specimens also contain isolated areas in which the epidermis is hyperpigmented, with transepidermal hyperpigmentation. Multifocal, within the dermis, there is marked infiltration by inflammatory cells — lymphocytes, plasma cells, and neutrophils. Histomorphological diagnosis: solid breast carcinoma with metastatic spread to a regional lymph node.

Macroscopic examination of the left axillary lymph node, obtained during lymph node dissection, which had enlarged two months after unilateral mastectomy in a cat named 'Sonya', revealed focal areas of necrosis, labeled as 1k — a fragment of a firm-elastic whitish lymph node measuring 2.0×1.3×1.0 cm with dark-brown areas within its thickness. Microscopically, the lymph node contains large necrotic areas and carcinoma structures (metastatic growth). The carcinoma structures are tubular, lined with epithelial cells. The cells range in shape from rounded and oval to polygonal. They have well-defined borders and a small amount of eosinophilic cytoplasm. The nuclei are oval, hyperchromatic, with deep

chromatin and a central nucleolus. Anisocytosis and anisokaryosis range from moderate to marked. Mitotic activity is approximately 55–60 mitotic figures per 10 high-power fields. Histomorphological diagnosis: carcinoma with neoplastic invasion of a lymph node.

To assess the relationship between the clinical stage of mammary gland tumors (according to the TNM system) and their histological characteristics (benign or malignant neoplasms), a statistical analysis was performed using the χ^2 criterion and Fisher's exact test. Data were analyzed by constructing contingency tables.

All breast neoplasms in animals were divided into two groups: (i) benign (adenomas, mixed tumors, fibroadenomatous changes); (ii) malignant (carcinomas, sarcomas, osteosarcomas).

In addition, clinical stages were conditionally grouped into: (i) early stages: T_1–T_2, N_0, M_0; (ii) advanced stages: T_3 and/or the presence of N_1 and/or M_1.

The analysis revealed that malignant tumors were significantly more often associated with advanced stages of the disease (presence of lymph node metastases and/or distant metastases), whereas benign tumors predominantly corresponded to early stages ($T_1N_0M_0$).

Application of the χ^2 criterion showed a statistically significant association between TNM stage and tumor type ($p < 0.05$). Given the small sample size and the presence of expected frequencies of less than 5 in some cells of the table, Fisher's exact test was additionally applied, which confirmed the reliability of the results obtained ($p < 0.05$). The results demonstrate a consistent and biologically plausible trend toward a more aggressive course of the neoplastic process in animals of the second group. In particular, when assessing the distribution by primary tumor stage (T), it was found that early-stage neoplasms (T_1) predominate in animals of the first group, whereas more advanced stages (T_2–T_3) are more frequently recorded in the second group. The observed difference has a clear directionality and indicates possible differences in the rate of tumor progression or the time of their detection. The results of the analysis of metastatic involvement (N and M) proved to be the most revealing. A significant increase in the frequency of metastases was observed in the second group (50%) compared to the first (10%), accompanied by the lowest p-value among all analyses performed and reflecting a pronounced trend toward increased invasiveness and metastatic potential of the tumors.

Separately, it was established that:

1. The presence of metastases in regional lymph nodes (N_1) was observed exclusively in malignant tumors;
2. Distant metastases (M_1) were recorded only in animals with highly malignant neoplasms (in particular, carcinomas and osteosarcomas);
3. Benign neoplasms did not metastasize.

The results obtained are consistent with the current understanding of the biological behavior of breast tumors in animals and are supported by data from the literature. In particular, the statistically significant association established in our study between the clinical stage according to the TNM system and the histological malignancy of the neoplasms corresponds to the conclusions of a number of authors who emphasize the leading role of staging in predicting the course of the disease. It has been shown that as the stage of the tumor process increases, animal survival rates decrease significantly, especially in the presence of metastases (Petrucci et al., 2021; Vazquez et al., 2023).

The trend identified in our study toward the association of malignant tumors with advanced stages (T_3, N_1, M_1) is also confirmed by data from other studies. Thus, breast carcinomas are characterized by a high frequency of metastasis, particularly to regional lymph nodes and the lungs, which is a key prognostically unfavorable factor (Soultani et al., 2021; Klaengkaew et al., 2021). In contrast, benign tumors typically do not exhibit invasive growth or metastasis, which is consistent with our findings regarding their predominant localization in early stages ($T_1N_0M_0$).

Of particular importance is the fact that involvement of regional lymph nodes (N_1) and the presence of distant metastases (M_1) were observed exclusively in malignant tumors. This is fully consistent with the literature, where metastasis is considered one of the most important independent prognostic factors, significantly reducing the animals' lifespan (Soultani et al., 2021). Furthermore, it is emphasized that even in the absence of clinical signs of metastasis, their microscopic presence can influence the prognosis, which justifies the need for a thorough histological evaluation of the lymph nodes.

Our data on the distribution of tumors by T stage are also consistent with the results of other studies, which indicate the importance of tumor size as a prognostic criterion. In particular, an increase in the size of the primary tumor is associated with a higher probability of metastasis and a poorer prognosis (Rose and Worley, 2020; Sánchez et al., 2019). This explains the prevalence of higher stages (T_2–T_3) among malignant neoplasms in our sample.

At the same time, the results confirm that the use of univariate analysis alone may be insufficient for a comprehensive assessment of prognostic factors. The literature repeatedly emphasizes that many indicators lose statistical significance in multivariate analysis, which indicates the complex, multicomponent nature of the tumor process (Zhelavskyi and Dmytriv, 2023). In this context, the use of the χ^2 criterion in combination with Fisher's exact test in our study is methodologically sound, especially given the small sample size.

Furthermore, the results are consistent with current approaches to the assessment of prognostic factors in veterinary oncology, which emphasize the need for a comprehensive consideration of the clinical, histological, and molecular characteristics of tumors (Feliciano et al., 2023; Pastor et al., 2022). Although our study focused primarily on morphological and clinical parameters, the data obtained support the need for further research incorporating molecular markers.

It should be noted that the results of our study reflect the general trends described in the literature but have certain limitations. In particular, the small number of animals in the sample reflects a common problem in most veterinary studies, as highlighted by other authors (Greco et al., 2023). This limits the statistical power of the analysis and necessitates further studies with larger samples.

Thus, the obtained results not only align with the data in the current scientific literature but also complement them, confirming the important role of TNM clinical staging in predicting the course of mammary tumors in animals. The clear association identified between the malignancy of neoplasms and the extent of the tumor process underscores the need for early diagnosis and timely surgical intervention, and justifies the use of a comprehensive approach to the assessment of prognostic factors.

In summary, based on the results presented, the following conclusions can be drawn:

1. There is a statistically significant association between the clinical stage of breast tumors according to the TNM system and their histological characteristics;

2. Malignant tumors are significantly more often detected in the late stages of the disease and are accompanied by metastatic involvement of lymph nodes and distant organs;

3. Benign tumors predominantly correspond to early stages ($T_1N_0M_0$) and show no signs of metastatic growth;

4. The presence of N_1 and M_1 components is a poor prognostic sign and may be considered a marker of aggressive disease progression;

5. The use of the χ^2 criterion in combination with Fisher's exact test is appropriate for analyzing small samples in veterinary oncology studies and allows for increased reliability of the results obtained.

Overall, the data obtained confirm that clinical staging according to the TNM system has significant prognostic value and correlates with the histological malignancy of breast tumors in animals, a fact that should be taken into account when developing diagnostic and therapeutic approaches.

Conclusions. 1. The data obtained allow us to draw a fundamentally important conclusion: the differences between the examined groups are related not so much to the size of the primary tumor node as to the tumor's biological behavior, specifically its ability to invade surrounding tissues and metastasize to distant sites. This is consistent with current concepts in veterinary oncology, according to which metastatic potential is the key factor determining the course of the disease and prognosis.

2. The study results indicate that when assessing mammary gland neoplasia, a more informative indicator is not only the size of the primary tumor (T), but primarily the presence and extent of metastases (N and M), which reflect the aggressiveness of the neoplastic process and have higher prognostic value.

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