THE RETROSPECTIVE ANALYSIS OF MAMMARY TUMORS IN DOGS

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Summary. The aim of the study was to evaluate the mammary tumor type in dogs, the relationships with tumor incidence and bitches age, investigate the frequency of tumor localization and survival time after the mastectomy. During 2009 year in 3 veterinary clinics of Kaunas 80 bitches with mammary gland tumors were treated. All animals were clinically examined. The complete resections of mammary tumors were performed. All 80 removed tumors were examined histologically. Statistical analysis was performed using Microsoft Excel 2003 and „Graph Prism ™ Version 2.0" spreadsheets.

It was found, that the highest percentage of mammary glands tumors was in dogs group aged 5-10 years old – 56% ($p<0.05$). In the group of the oldest animals – 11 year age and older – the percentage of mammary tumors was lower – 40% ($p<0.05$). The lowest percentage of mammary tumors was in the group of young bitches – 1 - 5 years old – only 4% ($p<0.05$). The histological examination showed that the most common tumor types of mammary glands in bitches were: simple carcinoma, complex carcinoma and carcinosarcoma – 46%, 27% and 13%, respectively. Fibroadenosis and inflammatory carcinoma were less common - 7% and 7%, respectively.

The most often tumors occur in caudal abdominal and inguinal mammary glands.

Only one 8 years age Doberman from all treated bitches had recurrence of mammary tumor during 1 year period after mastectomy.

Keywords: mammary gland, tumor, recurrence of the tumor, dogs.

RETROSPEKTYVI KALIŲ PIENO LIAUKŲ NAVIKŲ ANALIZĖ

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Santrauka. Tyrimo tikslas – nustatyti, kokios rūšies kalių pieno liaukų navikų diagnozuota daugiausia ir kurios pieno liaukos labiausiai pažeidžiamos; įvertinti amžiaus įtaką šiam patologiniam procesui ir apskaičiuoti išgyvenimo trukmę po mastektomijos. Tyrimas atliktas 2009 metais. Duomenys apie kalių susirgimus pieno liaukų navikais rinkti trijose Kauno veterinarijos gydyklose. Visos 80 gydytų kalių buvo tiriamos pagal klinikinio tyrimo metodikas, o mastektomijos metu pašalinti navikai tirti patomorfologiškai, įvertintas neoplastinio proceso piktybiškumas. Tyrimų rezultatų statistinė analizė atlikta kompiuterinėmis programomis „Microsoft Exel`2003" ir Graph Prism™. Version 2.0".

Nustatėme, kad pieno liaukos navikais dažniausiai sirgo 5–10 metų kalės – 56 proc. ($p<0,05$) visų pieno liaukų navikais sirgusių kalių. Rečiau pieno liaukų navikais sirgo vyresnės nei 10 metų kalės – 40 proc. ($p<0,05$). Retai pieno liaukų navikais sirgo 1–5 metų kalės – 4 proc. ($p<0,05$). Atlikę navikinių audinių histopatologinį tyrimą nustatėme, kad dažniausios navikų rūšys buvo karcinoma (46 proc.), karcinomos kompleksas (27 proc.) ir karcinosarkoma (13 proc.). Rečiau pasitaikė fibrozuojanti adenozė (7 proc.) ir uždegiminė karcinoma (7 proc.).

Dažniausiai navikinis procesas pažeidžia 4 ir 5 pieno liaukas atitinkamai 41 proc. ir 36 proc.

Per metus iš 80 gydytųjų tik vienai dobermanų veislės 8 metų kalei praėjus 6 mėn. po mastektomijos navikas recidyvavo.

Raktažodžiai: kalės, pieno liaukos, navikas, naviko recidyvas.

Introduction. Mammary gland neoplasms are the most commonly seen tumors in intact female dogs, but they are extremely rare in male dogs (Bostock, 1986; Misdorp 1988; Moe 2001; Morris et al., 2001; Sorenmo 2003). Affected male dogs usually have a hormonal imbalance such as an estrogen-secreting Sertoli cell tumor of the testis (Moulton, 1999). Most frequently mammary gland tumors are found in 5 years and older bitches (Murphy, 2008). Breed predisposition has been reported but varies in different studies. Dachshunds, cocker spaniels, toy poodles, German shepherds, mixed – breed dogs have been reported to have an increased incidence of mammary neoplasia (Rutteman, 1990).

The risk for benign tumors is estimated to be two or

five times higher than that for malignant lesions (Dobson et al., 2003). Based on histological criteria, it was determined that half (42-55%) of the surgically removed mammary tumors in bitches were malignant (Fidler et al., 1967; Owen et al., 1977; Priester 1979; Sorenmo 2003). But this date are very controversaly: Simeonov and Stoikov (2006) reported that 81% mammary tumors were malignant, and only 19% were benign origin.

Endocrine factors have big influence in the tumor genesis because hormones cause structural and functional changes in mammary glands (Noreika ir kt., 1998). The development of mammary gland neoplasms appears to be hormone-dependent because the risk of developing a mammary tumor increases as the number of estrous (heat) cycles increases. The risk of developing mammary gland tumors is 0.05% if the bitch is spayed prior to the first estrous cycle. The incidence of neoplasia increases to 8% if the bitch is spayed prior the second estrous cycle and to 26% if spayed after the second estrous cycle. An increased incidence of tumor development also has been observed in dogs that received injectable progestins for the prevention of estrus (Murphy, 2008).

The frequency of benign and malignant mammary tumors in dogs varies considerably due to the existense of different methods of tumor classification and lack of uniform criteria to differentiate these types of tumors (Pereira et al., 2006).

Morphological criteria alone may be insufficient for a proper diagnosis because when only histologically determined, benign tumors may incidentally give rise to metastasis, while canine complex adenomas and mixed tumors often show histomorphological evidence of malignancy (carcinoma or sarcoma in bening tumor) despite benign biological behavior (Pereira et al., 2006).

Clinical evaluation requires assessment of the following factors: (1) signalment, (2) general condition, (3) duration of signs, (4) rate of tumors growth, (5) recurrence, (6) size, (7) location, (8) consistency of tumors, (9) number of glands involved, (10) mode of growth, (11) ulceration, (12) fixation to skin or body walls, (13) lymph node enlargement, (14) lymphedema of extremity, (15) nipple deformity, (16) presence of distant metastasis. Multiple tumors occur in over 50 percent of the affected dogs. Multiple tumors reflect simultaneous primary neoplasms and/or spread by direct extension or metastasis. Early and complete resection and microscopic diagnostic examination are recommended (Madewell, Theilea, 1987).

Often bitches with mammary gland tumors are shown to veterinarian when tumors grow that big that dogs can't move normally. Therefore it is very important to diagnose that pathology in the correct time.

Surgery remains the basic treatment for dogs and cats with most type of mammary gland tumors. The exceptions are inoperable disease (e.g., inflammatory carcinoma of the dogs) and distant (organ) metastases. The adjuvant therapies are used for inoperable tumors and in inflammatory carcinoma – radiation therapy, chemotherapy. Ovariectomy and nonspecific immunotherapy are not effective (Withrow, Vail, 2007).

In Lithuania the priority in treatment of canine mammary gland tumors is given to mastectomy. The main problem is the survival time after the mastectomy and the possibility of metastases.

Objectives: The aim of the study was to evaluate the mammary tumor type in bitches, the relationships with tumor incidence and bitches age, investigate the frequency of tumor localization and survival time after the mastectomy.

Materials and methods: In 3 small animal clinics of Kaunas during 2009 year 80 bitches with mammary gland tumors were treated. *Anamnesis vitae et morbi* of all 80 bitches were recorded and they were examined by physical and radiographic examination.

The complete resections of mammary tumors were performed. All 80 removed tumors from 80 bitches were examined histologically and classified by type and localization. The pathological material was fixed in 10 % formalin solution for 2 days. The pathological material was processed with „Pathcentre" and embeded into paraffin. The 3µm slices were prepared and stained with hematoxylin and eosin (HE) (Mačiulskis ir kt., 2007). Statistical analysis was performed using Microsoft Excel 2003 and „Graph Prism ™. Version 2.0" spreadsheets. The arithmetic mean, mean square deviation and the coefficient of variation were calculated. The difference was considered as statistically reliable, if $p<0.05$.

All 80 bitches with mammary tumors were assorted according to age.

Scientific researches were made according to 1997. 11. 06 the law of animals care keeping and using in the Republic of Lithuania Nr. 8-500 ("Valstybės žinios", 1997. 11. 28, Nr. 108).

Results: Results showed, that tumors of the mammary glands were most common in 5 – 10 years old bitches - 45 cases (56%; $p<0.05$) (Fig. 1).

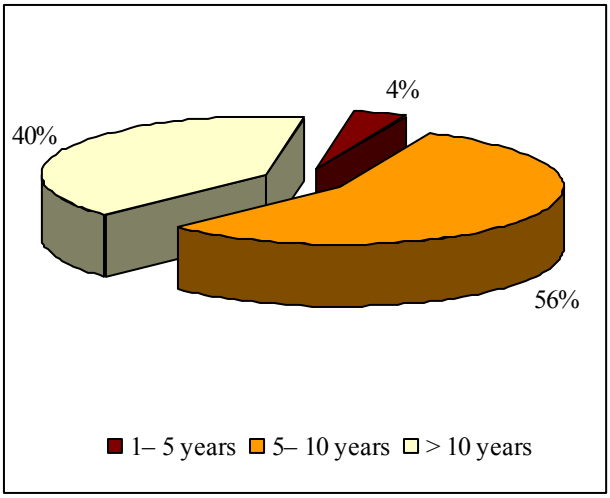

Fig. 1. **Incidence of mammary gland tumors in bitches of different age**

In this age group the youngest bitch was 6 year old, the oldest – 10 year old, the medium of age was 8.5 ± 0.19 years.

More often mammary tumors represented in bitches elder than 10 year old – 32 cases (40%; $p<0.05$) (Fig. 1). In this age group the youngest bitch was 11 year old, the oldest – 15 year old, the medium of age was 12.3 ± 0.22 years, the most common were 12 year old bitches (13 cases).

Rarely mammary tumors represented in bitches from 1 to 5 year old – 3 cases (4%; $p<0.05$) (Fig. 1). The youngest bitch in this group of age was 4 year old, the oldest – 5 year old, the medium of age was 4.3 ± 0.33 years, 2 of 3 bitches were 4 year old.

Based on results the youngest bitch with tumors of the mammary glands was 4 year old, the oldest – 15 year old. The most common were 10 year old bitches, the medium of age was 9.9 ± 0.28 years ($p<0.05$).

Murphy (2008) reported that mammary tumors represent more often in old, 10 – 11 year old, bitches, but this pathology is rare before the age of 2 years, although fibroadenomatous lesions occasionally occur in bitches as young as 1 year. Other scientists reported and we found also that the most common were 6 – 10 year old bitches (to 63%). Older than 10 year old bitches compound 32%, younger than 5 year old – 5% (Zatloukal et al., 2005).

Results showed, that commonly tumors occur in 4 (caudal abdominal) mammary gland – 33 cases (41%) and 5 (inguinal) mammary gland – 29 cases (36%). More often mammary tumors represented in 3 (cranial abdominal) mammary gland – 14 cases (18 %). The 2 (thoracic) mammary gland was rarely affected – 4 cases (5%) (Fig. 2).

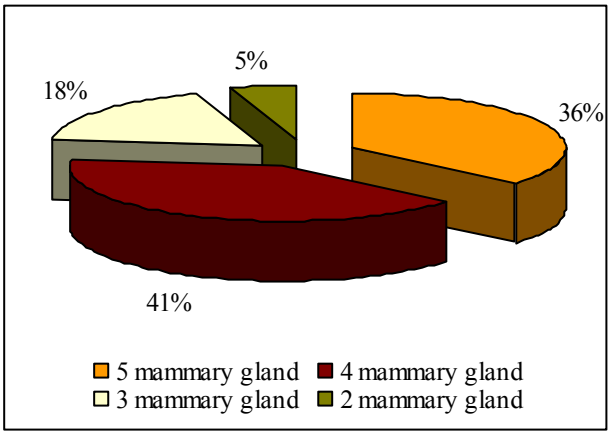

Fig. 2. **The distribution of tumors in mammary glands.**

Other scientists reported that the caudal mammary glands are more often affected than the cranial ones, probably because of their greater size (Dobson et al., 2003).

In canine mammary neoplasm, tumor type was an important independent factor and a range was observed of increasing malignancy from complex carcinoma (composed of both epithelial and mioepithelial components) to simple carcinoma (composed of the one type of cell – either epithelial or myoepithelial like cells) to sarcoma was oberved (Misdorp et al., 1999).

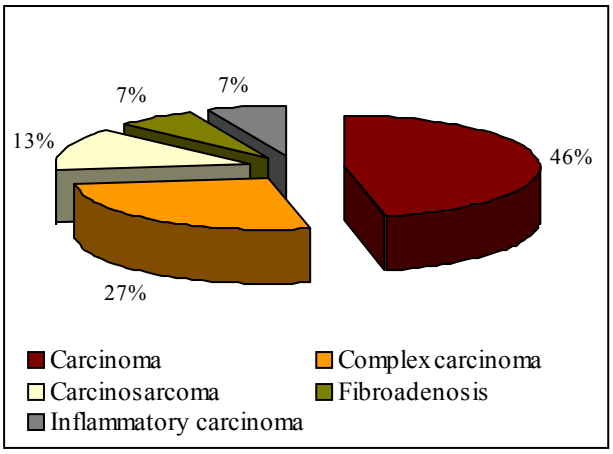

Fig. 3. **Types of mammary gland tumors**

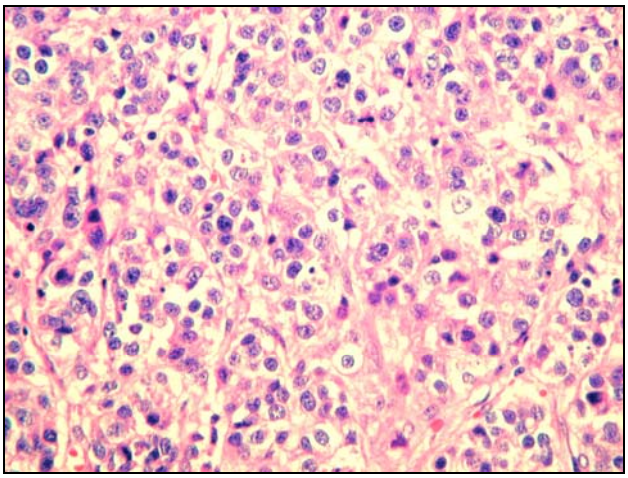

Fig. 4. **Solid carcinoma** (HE, large size)

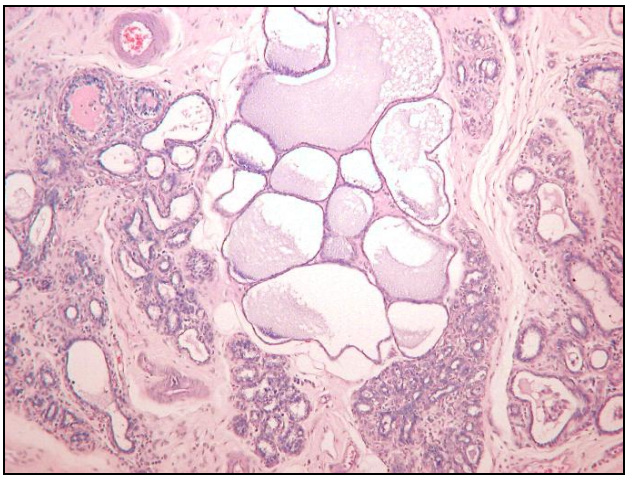

Fig. 5. **Fibroadenoma** (HE, small size)

80 tumors of these bitches were investigated and the most common type of tumor was simple carcinoma (Fig. 4) – 46% (37 cases). Complex carcinoma (Fig. 5) was found in 22 patients (27%), carcinosarcoma (Fig. 6) – in 11 patients (13%), fibroadenosis (Fig. 7) – in 5 patients

(7%) and inflammatory carcinoma (Fig. 8) – in 5 patients (7%) (Fig. 3). In one sample of carcinosarcoma we found the cartilage differentiation.

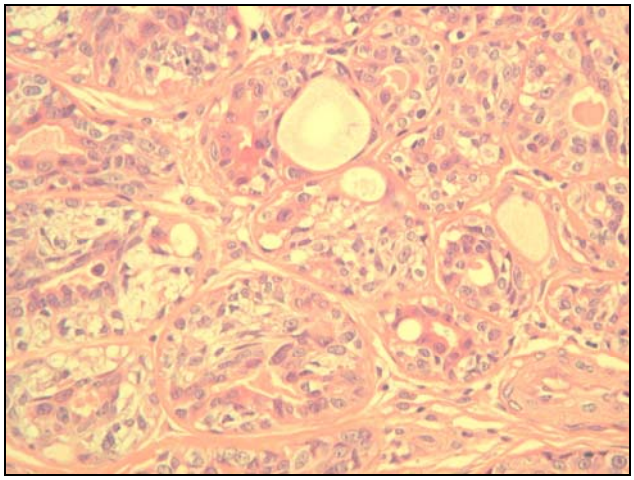

Fig. 6. **Complex carcinoma** (HE, medium size)

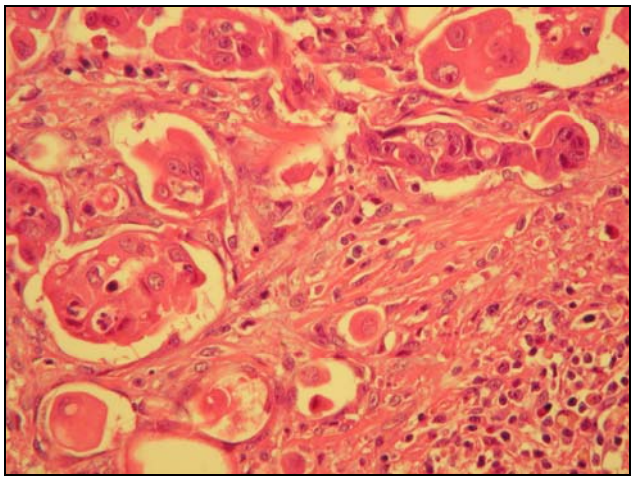

Fig. 7. **Tubulopapillary - cystic carcinoma with acute inflammation** (HE, medium size)

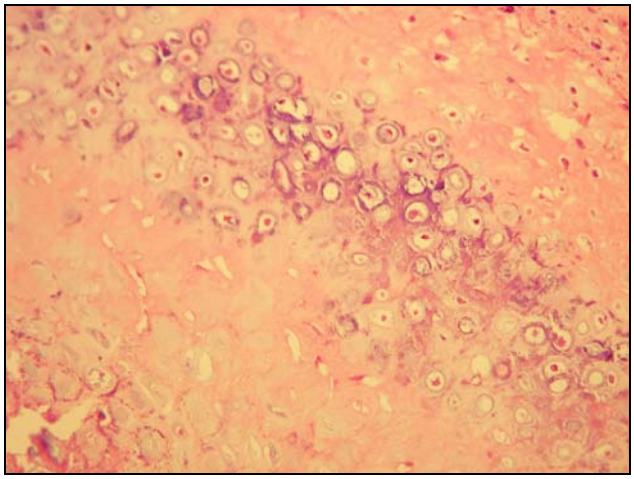

Fig. 8. **Carcinosarcoma with cartilage differentiation** (HE, medium size)

In 1940 Allen A. C. observed one feature in bitches mammary gland tumors. In their composition was found cartilage differentiation or osteoid. The reason of these alterations could be trauma.

Cribriform carcinoma was found in 11 of 37 bitches (29%), tubulopapillary carcinoma – in 11 of 37 bitches (29%), solid carcinoma - in 11 of 37 bitches (29%) and anaplastic carcinoma – in 4 of 37 bitches (13%) (Fig. 9).

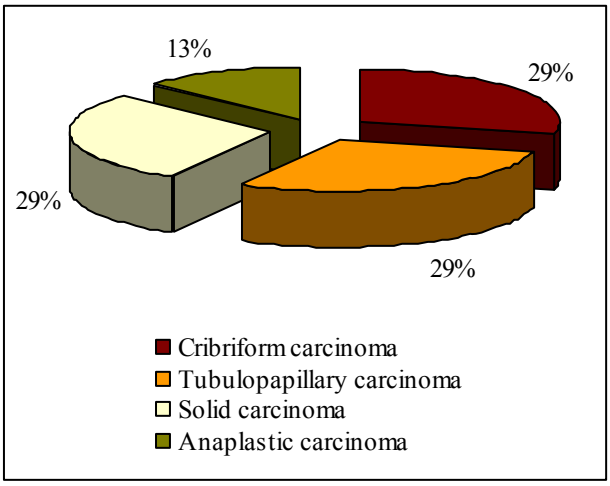

Fig. 9. **Types of carcinoma**

Meuten (2002) reported that about 20 – 40% of bitches with mammary tumors develop malignant tumors. Reziae et al. (2009) found that 70.6% of bitches had tubulopapillary carcinoma, 23.5% - solid carcinoma, 5.9% - cribriform carcinoma.

The prognosis is based on multiple factors. The type of tumor is important in determining the prognosis. Sarcomas are associated with shorter survival times than carcinomas. Other factors for poor prognosis are size of tumor, lymph node involvement, ulcerated tumor surface, rapid growth of tumor, tumor adherence to deeper tissues and nuclear differentiation (Dobson et al., 2003).

In 2009 from 80 examined bitches only one 8 years age Doberman, after 6 months after mastectomy had recurrence of tumor. That dog female was euthanized. Nowadays there is no generally confirmed method, which could let to find an exact prognosis about the survival time of bitches after conservative or radical therapy. In one study it was found that recurrence develops, from 10 to 12 months after radical therapy. Using conservative therapy (chemotherapy), distant metastasis develops and progress of pathological process begins after from 7 to 8 months from the beginning of treatment (Egenvall et al., 2005; Karayannopoulou et al., 2005; Matos et al., 2006; Simon et al., 2006; Hermo et al., 2008; Stratmann et al., 2008; de Oliveira et al., 2009; Queiroga et al., 2009; Simon et al., 2009; Hsu et al., 2009).

Some authors recommended that bitches should be observed about 2 years after mastectomy. Physical and radiographic examinations should be done every 4 – 6 months to reveal recurrence or metastasis. Simon et al. (2006) found that survival time of bitches with benign

mammary tumors is 3.5 years and with malignant tumors - about 1 year. Recurence from bitches with malignant tumors of the mammary gland could develop after 10 months or 2.5 years after mastectomy and metastasis could develop from 10 months to 1.5 years after surgical removal.

Conclusions:

1. Tumors of the mammary glands were most common in 5 – 10 year old bitches - 56% (45 cases; $p<0.05$); the medium of age was 8.5 ± 0.19 years.
2. The most common type of tumor was simple carcinoma – 46% (37 cases).
3. In 2009 from 80 bitches with mammary gland tumors only in 1 bitch developed metastazes (1.25%).
4. The most often tumors occur in caudal abdominal (41%) and inguinal mammary (36%) glands.

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