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Epidemiological profile of canine neoplasms in São Luís/MA: a retrospective study (2008-2015)

Perfil epidemiológico de neoplasias caninas em São Luís/MA: estudo retrospectivo (2008-2015)

Perfil epidemiológico de neoplasias caninas em São Luís/MA: estudio restropectivo (2008-2015)

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Abstract

The diversity of neoplasms observed in dogs can vary geographically depending on individual susceptibility, the habitat of the animals, and environmental characteristics. The aim of this study was to evaluate the epidemiological aspects of neoplasms in dogs treated at the Veterinary Hospital of the State University of Maranhão from 2008 to 2015. We studied the medical records of 1089 dogs affected by neoplasms and treated at a hospital during the period of study, relating to the casuistry with their breed, age, sex and origin. The present study included 764 cases that were confirmed through cytopathology. The most prevalent tumors were transmissible venereal tumors (TVT) (20.17%), adenocarcinoma of the mammary gland (19.53%), mixed malignant tumor of the mammary gland (18.63%), mast cell tumor (11.31%), and mammary carcinoma (6.42%). Females with a mean age of 9.2 years were the most affected, as were SRDs, Poodles, American Pitbulls, and Dobermann Pinschers. According to the cytomorphogenetic classification, the round cell tumors were the most prevalent, with values close to those of epithelial, followed by mixed and mesenchymal cells.

Keywords: Dogs; Cytopathology; Epidemiology; Oncology.

Resumo

A diversidade de neoplasias observadas em cães pode variar geograficamente em função da susceptibilidade individual, hábitos dos animais e aos fatores ambientais. Objetivou-se avaliar os aspectos epidemiológicos das neoplasias em cães atendidos no Hospital Veterinário da

UEMA, no período de 2008 a 2015. Foram analisados ao todo, 1089 prontuários de cães acometidos de neoplasias, atendidos no Hospital Veterinário nesse período, relacionando a casuística com a raça, idade, sexo e origem. Dentre os prontuários analisados, foi observado que 764 casos foram confirmados por meio de punção aspirativa com agulha fina. As neoplasias mais prevalentes foram TVT (20,17%), adenocarcinoma mamário (19,53%), tumor misto maligno mamário (18,63%), mastocitoma (11,31%) e carcinoma mamário (6,42%). Fêmeas com média de idade de 9,2 anos foram os animais mais acometidos e dentre os padrões raciais mais frequentes destacaram-se SRD, Poodle, American Pitbull e Dobermann Pinscher, respectivamente. Quanto à classificação citomorfogenética, os tumores de células redondas foram os mais prevalentes, com valores próximos aos de origem epitelial, seguidos pelos mistos e mesenquimais.

Palavras-chave: Cães; Citopatologia; Epidemiologia; Oncologia.

Resumen

La diversidad de neoplasias observadas en perros puede variar geográficamente según la susceptibilidade individual, hábitos de los animales y a los factores ambientales. El objetivo fue evaluar los aspectos epidemiológicos de las neoplasias en perros atendidos en el Hospital Veterinário de UEMA, de 2008 a 2015. En total, se analizaron1089 historias clínicas de perros afectados por neoplasias, atendidos en el Hospital Veterinário durante ese período, relacionando la muestra con la raza, edad, sexo y origen. Entre las historias clínicas analizadas, se observó que 764 casos fueron confirmados mediante aspiración con aguja fina. Las neoplasias más prevalentes fueron TVT (20,17%), adenocarcinoma de mama (19,53%), tumor maligno mixto de mama (18,63%), mastocitoma (11,31%) y carcinoma de mama (6,42%). Las hembras con una edad promedio de 9.2 años fueron los animales más afectados y entre los patrones raciales más frecuentes se destacaron SRD, Poodle, American Pitbull y Dobermann Pinscher, respectivamente. Con respecto a lá classificación citomorfogenética, los tumores de células redondas fueron los más prevalentes, con valores cercanos a los de origen epitelial, seguidos de los mixtos y mesenquimales.

Palabras clave: Canino; Citopatología; Epidemiología; Oncologia.

1. Introduction

Neoplasm is a word of Greek origin that means new formation, where local proliferation of atypical and anaplastic cells occurs without apparent cause, leading to rapid,

progressive, and unlimited growth. Neoplasms are commonly known as tumors and when malignant are called cancer. Oncology is the medical specialty responsible for the study of benign and malignant neoplasms (Tavera, 2004).

The highest frequency of search for veterinary care by pets' tutors has facilitated the diagnosis of diseases that would have gone unnoticed, from those easily treated to the most serious, including some neoplasms. The incidence of tumors in dogs has increased considerably. According to Withrow (2007), 45% of dogs over 10 years old die due to cancer and its complications. This pattern implies that tumors are the primary cause of death, especially in pets because of their increased longevity.

Aspiration cytology is a minimally invasive diagnostic test; therefore, it is preferred for evaluation of neoplastic cells. Moreover, its low cost and ease of execution, as long as it is conducted by a trained professional, allows the collection of large amounts of samples and faster results (Magalhães et al., 2001; Teixeira et al., 2010).

However, geographic location may interfere with the appearance of neoplasms in small animals due to differences in susceptibility and habits of animals, as well as environmental factors (Souza et al., 2006). Thus, local and regional epidemiological studies could contribute to the diagnosis of neoplasms.

Therefore, the aim of this study was to conduct a retrospective study on the profile of dogs affected by neoplasms at the Veterinary Hospital "Francisco Edilberto Uchôa Lopes" of the State University of Maranhão, São Luís, Brazil, from 2008 to 2015.

2. Methodology

The study was characterized as a retrospective epidemiological case study, carried out at the Veterinary Hospital and at the Anatomopathology Laboratory of the State University of Maranhão. Data were obtained through the analysis of veterinary data sheets from 2008 to 2015. The number of confirmed cases, the casuistry in the canine population studied, the diagnostic method, and the variables of breed, sex, and age were studied. Cytopathological diagnoses and tumor classification were compared with those presented by McGavin & Zachary (2009) and Raskin & Meyer (2011). Data were tabulated in Microsoft Office Excel 2010 spreadsheets and subjected to descriptive statistical analysis.

3. Results and Discussion

In the period from 2008 to 2015, 1089 suspect animals were treated at the Veterinary Hospital, of which 764 were diagnosed with some type of neoplasia using fine needle aspiration. The percentage of neoplasm-positive animals was quite variable over the period of study (Table 1).

Table 1 - Frequency of dogs with clinical suspicion of neoplasms and confirmed cases between 2008 and 2015 in São Luís-MA, Brazil.

Year	Suspected animals	Confirmed cases		Absolute percentual (%)
		Total	%	
2008	65	21	32,31	2,75 (21/764)
2009	59	20	33,90	2,62 (20/764)
2010	28	16	57,14	2,09 (16/764)
2011	35	28	80,00	3,66 (28/764)
2012	54	31	57,41	4,06 (31/764)
2013	141	105	74,47	13,74 (105/764)
2014	243	184	75,72	24,08 (184/764)
2015	464	359	77,37	46,99 (359/764)
Total	**1089**	**764**	**100**	

Source: Authors.

Of the 764 dogs diagnosed with unique types of neoplasia, 13 had more than one type of tumor patterns, so the total number of cases increased to 778. Specifically, 12 animals had two different types of tumors and one animal had three types (carcinoma, malignant mixed tumor, and lipoma). In the records analyzed, 70.07% (n=535) of the sick dogs were female and 30.23% (n=231) were male. Santos *et al.* (2013) observed a higher incidence of neoplastic diseases in females, with a percentage of 58% (n=121), than in males at 42% (n=89). The high prevalence of neoplasms in females may be due to mammary gland neoplasms.

Table 2 shows that 27 different types of tumors were diagnosed during the period of this survey. Transmissible venereal tumor (TVT), adenocarcinoma, mixed malignant tumor, mast cell tumor, and mammary carcinoma represented 75% of all neoplasms diagnosed in this study. Twenty-seven different types of neoplasms were also reported by Santos et al. (2013) (7.6%), where adenocarcinomas were the most prevalent (70%), followed by mast cell tumor grade II (8.10%), osteosarcoma (4.80%), and TVT (5%). Salvado (2010) reported that the most frequent neoplasms in dogs were carcinoma (32.2%), adenoma (11.9%), mast cell tumor (6.2%), papilloma (4.2%), and histiocytoma (3.35%).

Table 2 - Canine neoplasms diagnosed at the Anatomopathology Laboratory of Universidade Estadual do Maranhão (2008–2015).

Cytological classification	Classification	N	(%)
Transmissible Venereal Tumor	Round Cells	157	20.17
Adenocarcinoma	Epithelial	152	19.53
Mixed malignant tumor	Mixed	145	18.64
Mastocytoma	Round Cells	88	11.31
Breast carcinoma	Epithelial	50	6.43
Hemangiosarcoma	Mesenchymal	29	3.87
Melanoma	Epithelial	23	3.07
Fibrosarcoma	Mesenchymal	17	2.27
Lymphoma	Round Cells	18	2.31
Lipoma	Mesenchymal	15	1.93
Squamous cell carcinoma	Epithelial	12	1.60
Adenoma	Epithelial	11	1.47
Liposarcoma	Mesenchymal	09	1.20
Histiocytoma	Round Cells	08	1.03
Basal cell carcinoma	Epithelial	08	1.03
Plasmocytoma	Round Cells	08	1.03
Fibroma	Mesenchymal	06	0.80
Sebaceous carcinoma	Epithelial	04	0.53
Hemangiopericytoma	Mesenchymal	04	0.53
Inflammatory Carcinoma	Epithelial	04	0.53
Leiomyoma	Mesenchymal	03	0.40
Seminoma	Epithelial	02	0.27
Ameloblastoma	Epithelial	01	0.13
Hepatocellular carcinoma	Epithelial	01	0.13
Chondrosarcoma	Mesenchymal	01	0.13
Osteosarcoma	Mesenchymal	01	0.13
Papilloma	Epithelial	01	0.13
Total		**778**	**100**

Source: Authors.

The most prevalent neoplasm was TVT (20.27%). Among these animals, 70 were males and 87 were females. The mean age of affected dogs was 9.1 years, ranging from 2 to 15 years. This tumor is usually associated with uncastrated dogs and can be transmitted through coitus, but it can also be spread through social interactions such as sniffing, licking, scratching, or biting, allowing the implantation of tumor cells through direct contact and characterizing extragenital locations of the tumor. Due to this characteristic, a vast majority of the affected animals were wandering, as described by Sousa et al. (2000), or with free access to the streets and were taken to the veterinary hospital by protectors. This pattern is similar to that reported by Rossetto et al. (2009), who observed a higher frequency of TVT in dogs diagnosed through cytological examination in the city of Londrina, Paraná, Brazil.

Adenocarcinoma was the second most prevalent neoplasm, where 152 animals were diagnosed, of these 37 were males and 115 were females. The mean age for this neoplasm was 10 years, ranging from 3 to 15 years. Mongrel dogs, Poodles, Dobermann Pinschers, German Shepherds, and Boxers had the highest incidence. According to Salvado (2010), adenocarcinoma was the most commonly found neoplasm of the dog reproductive tract, as adenocarcinoma appears in secretory glandular cells.

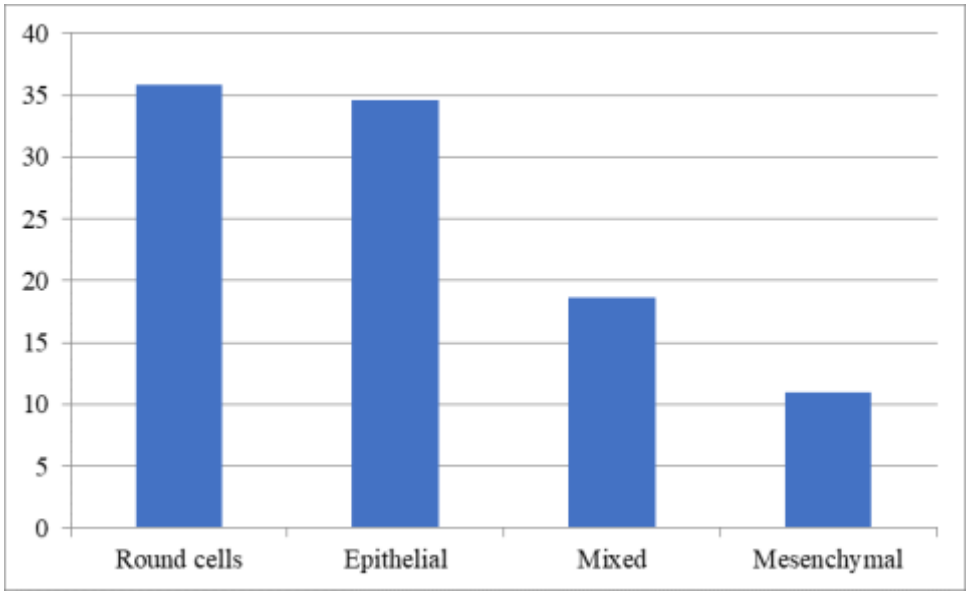
The mixed malignant tumor affected 145 animals, of which 6 were males and 139 were females. The mean age of the dogs was 10.3 years, ranging from 6 to 15 years. The animals most affected were mongrel dogs, Dobermann Pinschers, Rottweilers, and American Dobermans. Studies by Stasiaki et al. (2015) showed that mixed tumors were the second most prevalent of breast tumors.

Another very common tumor was the mast cell tumor, affecting 31 males and 57 females, including the following three types: grade I, grade II, and grade III, according to Patnaik et al. (1984). The mean age was 8.7 years, ranging from 4 to 15 years. Mongrel dogs, American Pitbulls terrier, Poodles, and Labradors retriever were more affected by this neoplasm. Thamm and Vail (2007) found that the incidence of mast cell tumors corresponded to 21% of canine skin tumors.

Breast carcinoma was the fifth most incident tumor. This tumor was diagnosed only in females, totaling 50 animals. The mean age was 7.7 years, ranging from 3 to 15 years. Mongrel dogs, Poodles, and Dobermann Pinschers were the most affected breeds. According to Salvado (2010), mammary carcinoma was the most common neoplasm in dogs, followed by skin carcinoma.

Regarding cytomorphogenetic classification, round cell tumors were the most prevalent, with values very close to those of epithelial origin, followed by mixed and mesenchymal tumors (Figure 1). These results differ from those reported by Souza et al. (2006), where mesenchymal tumors were the most frequent.

Figure 1 - Origin of neoplasm diagnosed in dogs, in the period of 2008 – 2015.



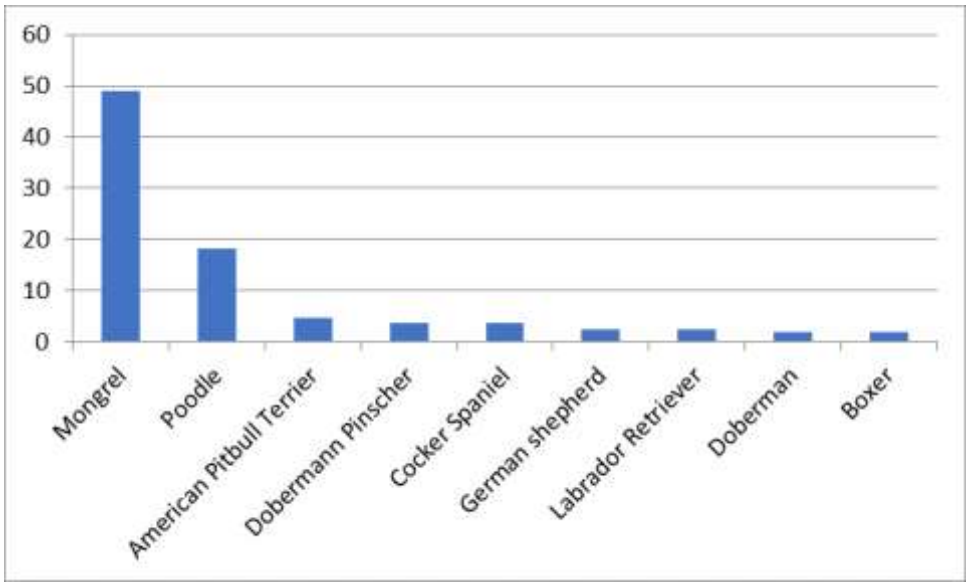
Source: Authors.

According to the criteria proposed by Morrison and Denicola (1993), neoplasia of epithelial and mesenchymal origins are subclassified as benign or malignant. Epithelial tumors can originate from the ectoderm, mesoderm, and endoderm. Mesenchymal cells originate from cells derived from the embryonic leaflet of the mesoderm (Jericó et al., 2015).

In a report by Rossetto *et al.* (2009), the most frequent tumors were round tumors, which constituted 44.85% (n=457) of all neoplasms, followed by epithelial cells with 35.42% (361/1019), mesenchymal cells 16.39% (n= 167), and neoplasms whose differentiation was not possible only through cytological examination, totaling 3.34% (n=34).

Of the 778 neoplasms diagnosed, mongrel dogs had the most neoplasms, with 47.43% of the cases (*n* = 369), followed by Poodles (*n* = 136), American Pitbulls terrier (*n* = 35), Dobermann Pinschers (*n* = 18), Cockers spaniel (*n* = 27), Labradors retriever (*n* = 18), Dobermans (*n* = 14), and Boxers (*n* = 14). This pattern is similar to the that in the findings of Salvado (2010), who found that mongrel dogs had the most cases of neoplasia, followed by Dobermann Pinschers, Cockers spaniel, and Poodles. Meirelles et al. (2010) also found the highest prevalence of skin neoplasms among mixed-breed dogs, followed by Poodles, Boxers, and Cocker spaniels. Rossetto et al. (2009), in comparison, found the highest incidence of skin neoplasms among mongrel dogs, followed by German Shepherds, Boxers, Poodles, and Fila Brasileiros (figure 2).

Figure 2 - Distribution of the main canine breeds with neoplasia diagnosed in São Luís - MA (2008–2015).



Source: Authors.

Most of the affected animals were elderly, confirming the results of other studies such as those by Rossetto et al. (2009) and De Nardi et al. (2002), who reported that older animals were more likely to develop neoplasms. Andrade et al. (2012) reported that dogs affected by neoplasms were between 4 months and 17 years old. This relationship between neoplasms and age shows that, over time, immune cells lose their ability to destroy unwanted cells that can induce a neoplasm leading to the development of cancer, highlighting the great importance of the veterinarian's preventive work together with that of the dog owners.

Data on the main neoplasms, including median age, sex, and the most affected breeds, are listed in Table 3. Dogs with no defined breed have a higher prevalence of tumors, as well as the elderly and female dogs, for many but not all types of neoplasia.

Table 3 - Mean age (years), sex, and breed of dogs affected by the major diagnosed tumors.

Cytological classification	**Average age years)**	**Sex (%)**	**Breed (%)**
Transmissible Venereal Tumor	9.10	M: 44.08 F:55.92	Non-defined breed (57.60) Dobermann Pinschers (20.50) Poodle (8.40)
Adenocarcinoma	10.00	M: 23.80 F: 76.20	Non-defined breed (34.70) Poodle (30.80) Dobermann Pinscher (25.80)
Mixed malignant tumor	10.30	M: 4.32 F: 95.68	Non-defined breed (25.40) Dobermann Pinscher (24.60)

			Rotweiller (15.70)
Mastocytoma	8.70	M: 34.48 F: 65.52	Non-defined breed (48.30) American Pitbulls terrier (23.60) Poodle (11.40)
Breast carcinoma	7.70	F: 100.00	Non-defined breed (58.10) Poodle (22.05) Dobermann Pinscher (9.70)
Hemangiosarcoma	9.30	M: 58.62 F: 41.38	Pitbull (22.20) Poodle (17.90) Non-defined breed (12.20)
Melanoma	12.20	M: 30.43 F: 69.57	Non-defined breed (14.40) Poodle (12.80) Rotweiller (9.50)
Fibrosarcoma	7.50	M: 52.94 F: 47.06	Non-defined breed (30.20) Poodle (13.70) Cocker spaniel (5.90)
Lymphoma	9.60	M: 47.06 F: 52.94	Non-defined breed (38.50) Cocker spanie (15.90) Poodle (10.50)
Lipoma	6.50	M: 14.29 F: 85.71	Non-defined breed (29.70) Labrador retriever (16.40) Rotweiller (11.80)
Squamous cell carcinoma	7.60	M: 58.33 F: 41.67	Non-defined breed (56.70) Cocker spaniel (18.80) Yorshire (12.30)
Adenoma	6.50	M: 72.73 F: 27.27	Non-defined breed (39.80) Poodle (20.10) German Shepard (16.90)

Source: Authors.

When considering the total number of samples that the laboratory received during the period from 2008 to 2015, it can be concluded that the frequency of neoplasia was 69.83% of suspected animals. This high percentage reinforces the importance of studies in this area, aiming at better preparation of veterinarians, hospitals, and veterinary clinics in order to employ treatments suitable for the tumors found.

4. Conclusion

Neoplasms were more frequent in mixed-breed dogs, which may either be due to the fact that these animals receive less veterinary care or because they represent the largest contingent treated by the veterinary hospital. Poodles are also highly affected, which also

leads us to believe that genetic factors influence the occurrence of neoplasia. The number of cases is high among elderly dogs because of their lowered capacity to destroy unwanted cells.

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