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RESEARCH ARTICLE PATHOLOGY

INCIDENCE, CYTOLOGY, GROSS PATHOLOGY AND HISTOPATHOLOGY OF MAMMARY TUMOURS IN DOGS OF CHENNAI

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ABSTRACT

The current research work was undertaken with the objective of evaluating incidence, cytology, gross pathology and histopathology of canine mammary tumours. Population incidence was 0.39 percent. Per cent incidence was 37.25. Pure breeds were commonly affected (83.60%) with highest incidence in the Spitz (33.33%). The highest incidence of mammary tumour was found between 9-12 years of age with a mean age of 9.45 years. Intact animals were mostly affected. Posterior pair of glands was predominantly affected. NAF and FNAB revealed 66.66 per cent and 71.93 per cent malignancy. Thoracic metastasis was observed in 12.28 per cent of dogs. Tumours were staged according to TNM staging and classified on the basis of WHO classification (2002). According to Elston and Ellis grading method, out of 40 mammary gland tumours 27 were in grade I and 13 were in grade II.

KEY WORDS

Canine - Mammary tumour – Age – Breed - Gland wise

INTRODUCTION

Tumours of the mammary glands are one of the common neoplasms encountered in female dogs and ranked second compared to skin neoplasms[10]. Both benign and malignant neoplasms represent approximately 50 per cent of all mammary tumours, which can affect all breeds but certain breeds show higher prevalence[9]. Huge body of literature has been compiled on the various factors that predispose canines to mammary tumours which are attributed to various factors such as Age, Breed, Sex and glandular wise. High incidence of mammary tumours is commonly reported in pure breeds when compared to cross-bred dogs[5]. There was a rise in rate of mammary tumours in dogs between 6 and 8 years of age[8] with an increasing frequency of mammary tumours from the axillary to the inguinal region[2, 6] and are well known for their notoriousness due to their histological variation and behaviour. The objective behind the current research work was to study the incidence and pathological aspect of canine mammary tumours in chennai.

MATERIALS AND METHODS

This current research work was carried out at the Department of Veterinary Pathology, Madras Veterinary College, Chennai, Tamil Nadu, India. A total of 61 cases were recorded and 40 cases with 54 surgically resected tumour glands were collected. Clinical data of suspected cases like history, species, breed, age, sex and breeding history, clinical manifestations, metastasis, location, size, shape and appearance of cut surface of tumours were recorded. In many of the cases, radiological data were also collected.

Besides, the mammary tumor data were recorded from the canine carcasses submitted to the Department of Veterinary Pathology. NAF and FNAB samples were stained using Leishman-Giemsa stain and also haematoxylin and eosin as per standard procedures and categorized under light microscopy into neoplastic (benign and malignant) and non-neoplastic conditions [13]. The tissue samples were fixed in Neutral buffered formalin for 48 hrs and processed accordingly and stained with Haematoxylin and Eosin. The tumours were classified according to WHO classification [7] and graded in accordance with Elston and Ellis grading method [14].

RESULTS

Out of 14,326 clinical cases presented during eight months of study, 157 (1.09%) cases that showed neoplastic conditions, 96 (0.67%) dogs had skin tumours and 61 (0.42%) mammary tumours. All 61 cases were females. Per cent incidence of skin tumours among 153 cases was 62.75 percent (96/153) and mammary tumours were 37.25 percent (57/153). The breed wise incidence of mammary tumours in dogs is presented in Fig. 1. Out of 61 dogs, pure breeds constituted 51 cases and non-descript 10 cases. Among the pure breeds, Spitz breed showed an incidence of 17 cases followed by German shepherd (n=16) and Doberman (n=9).

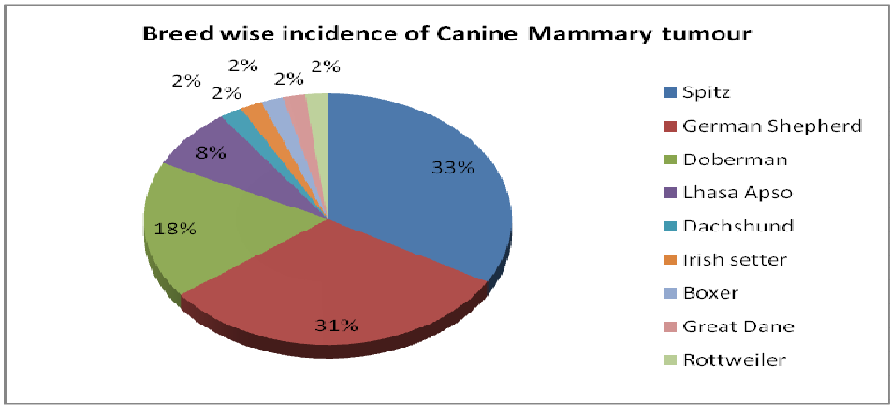

Figure 1

The age wise incidence of mammary tumours in dogs is presented in Fig. 2. The mean age of incidence of mammary tumour was 9.45 years with a range of 2 to 17 years. The highest incidence occurred in the age range of 9 to 12 years (27/61), followed by 6-9 (14/61). The lowest age at which mammary tumour recorded was 2.0 years.

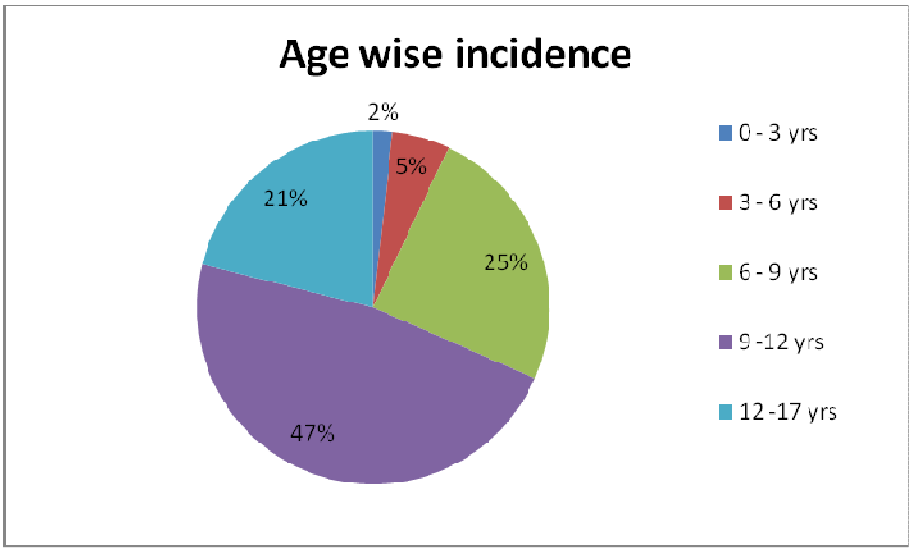

Figure 2

The gland wise occurrence of mammary tumours is given in Table 1. In 61 female dogs, a total of 79 glands had palpable tumour masses, of which 42 involved right and 37 involved left chains of glands. Inguinal and caudal abdominal glands showed a higher incidence with 27 (34.17%) and 30 (37.80%) respectively and lower incidence in thoracic glands i.e. cranial 1 (1.26%) and caudal 8 (10.12%).

Table 1

Gland wise occurrence of mammary tumours in female dogs

Location	Right	Per cent	Left	Per cent	Total	Per cent
Cranial thoracic	-	0.00	1	2.70	1	1.26
Caudal thoracic	5	11.90	3	8.10	8	10.12
Cranial abdominal	7	16.66	6	16.22	13	16.45
Caudal abdominal	16	38.10	14	37.83	30	37.80
Inguinal	14	33.33	13	35.15	27	34.17
Total	42	53.16	37	46.84	79	100

REPRODUCTIVE STATUS

The reproductive status of dogs bearing mammary tumours is given in Table 2. Out of 61 female dogs, 54 were intact, three cases were spayed after whelping and four cases from the field did not possess valid history details. Of these, 16 dogs whelped more than two times, 10 dogs whelped once and 31 cases were not bred.

Table 2
Reproductive status of female dogs with mammary gland tumours

	Reproductive status	No. of cases	Per cent
a. Spaying	Intact	54	94.73
	Spayed before breeding	-	-
	Spayed after whelping	3	5.27
b. Whelping	Whelped	24	42.12
	Spayed	2	3.50
	Not whelped	31	54.38

CYTOLOGY - NAF YIELDERS

Out of 57 tumour bearing female dogs excluding four field cases where NAF was not obtained, 18 (36.73%) were NAF yielders and 31(63.27%) were non-yielders. Six cases had ulcerated tumour mass and two of the cases where NAF could not be collected. NAF was mostly serous to reddish brown in color.

NAF CYTOLOGY

Out of 18 NAF yielders, 12 (66.66%) showed malignant epithelial cell clusters, anisokaryosis and vacuolated cytoplasm (Fig. 3a). Neoplastic cell clusters also showed mitotic figures (Fig. 3b). Two cases (11.11%) showed intact or degenerate neutrophils and four (22.22%) non-diagnostic. Some samples showed occasional pigmented cells.

FNAB CYTOLOGY

Out of 57 FNAB samples collected, one (1.75%) showed adenoma, 41 (71.93%) carcinoma with anisokaryosis, coarse chromatin, hyperchromatic nuclei reduced nucleus to cytoplasmic ratio or lace-like chromatin and four (7.0%) showed carcinosarcoma i.e., spindle to plumpy cells with hyperchromatic nuclei eosinophilic osteoid tissue, binucleated cells (Fig. 3c) and osteoid element with spindle cells and osteoblasts, and eight (14.03%) showed inflammatory cells, three were (5.26%) non-diagnostic samples.

GROSS PATHOLOGY

Tumours were usually round to elliptical in shape, soft to hard in consistency , ulcerated (Fig. 4a) , variable sized multiple nodules, cut surface showed grayish white areas, variable sized lobulations, cystic spaces (Fig. 4b) filled with sero sanguineous fluid, cartilaginous structures (Fig. 4c) in cases of carcinosarcoma.

TNM CLINICAL STAGING

Out of 57 female dogs, three tumours were in stage I, seven in stage II, 40 in stage III and 7 in stage IV. All four field cases lacked sufficient gross details.

HISTOPATHOLOGY

Tumour tissues were obtained from 40 cases (including four field cases) with 54 mammary tumour affected glands. The tumours were categorized according to WHO classification of canine mammary tumours.

I. Carcinoma

i. Tubular - Simplex (Fig. 5a) - **20**
- Complex (Fig. 5b)

ii. Papillary (Fig. 5c) - **03**

iii. Papillary-cystic (Fig. 5d) - **11**

iv. Squamous cell carcinoma (Fig. 5e) - **02**

II. Carcinosarcoma (Fig. 5f) - **18**

Total - **54**

LYMPH NODE INVOLVEMENT

Out of 57 dogs, 18 cases (31.58%) had swollen lymph nodes. Out of these, 16 dogs had undergone surgery and in six dogs, lymph nodes had grayish white metastatic foci collected either during surgery or post mortem examination. One case showed neoplastic clusters in a lymphode biopsy. On histopathological examination five of the cases had metastatic foci and in one case showed lymphatic emboli. Other lymph nodes revealed reactive hyperplasia with plasma cell infiltration.

METASTASES

Out of 57 canine mammary tumour cases, four cases were subjected to post mortem examination, showed metastasis to lungs (Fig. 4d), liver and regional lymph nodes.

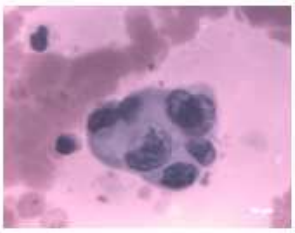

Fig. 3a - Anisokaryosis

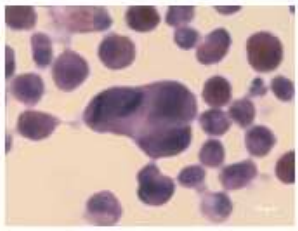

Fig. 3b – Mitotic figures

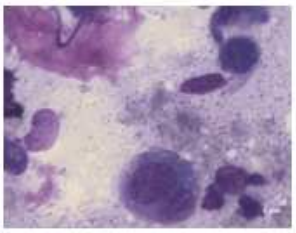

Fig. 3c –Binucleated cell

Fig. 4a – Ulcerated Gland

Fig. 4b – Cystic Gland

Fig. 4c - Cartilagenous Gland

Fig. 4d –Lung Metastasis

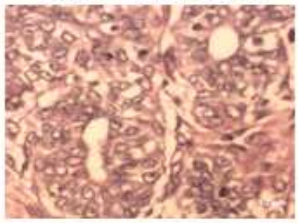

Fig. 5a – TAC-Simplex

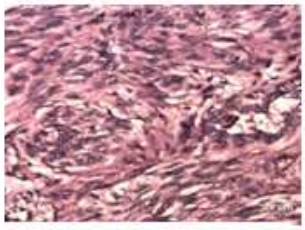

Fig. 5b – TAC - Complex

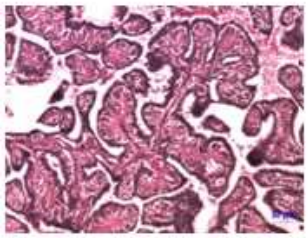

Fig. 5c – Papillary Type

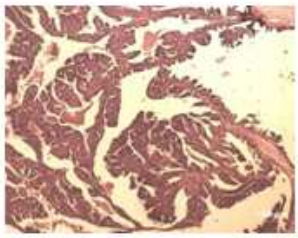

Fig. 5d – Papillary Cystic Type

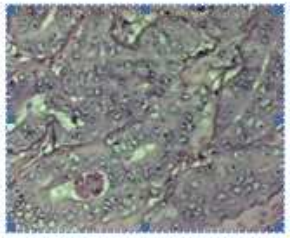

Fig. 5e – Sq.C.C.

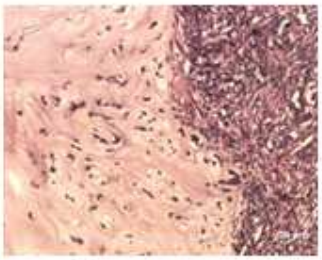

Fig. 5f - Carcinosarcoma

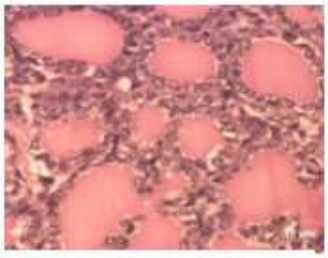

Fig. 6a – Grade I – Good Tubule formation

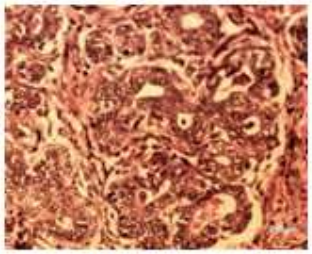

Fig. 6b – Grade II – Moderate Tubule Formation

ELSTON AND ELLIS METHOD OF GRADING

Canine mammary tumours were graded based on tubule formation, nuclear and cellular pleomorphism, hyperchromatism and mitosis. Out of 40 mammary gland tumours 27 were in grade I (Fig. 6a) with well formed tubules and 13 were in grade II (Fig. 6b) showing moderate tubule formation.

DISCUSSION

Mammary tumour constituted 0.39 per cent of clinical cases which was higher than previous report of 0.35 per cent[11] and lower than the previous reports of 0.60 percent[1] from chennai. This continuous and fluctuating trend in the occurrence of mammary tumours in Chennai[17]could be due to increase in pure breed population and also due to effective birth control measures adopted in bitches. Mammary tumours constituted 37.25 per cent of (n=153) tumour cases recorded during the period of study. This was higher than the previous reports of 21 per cent[18], 29.87 percent[1].

Mammary tumours were recorded mostly in pure breeds (83.60%) especially in Spitz (33.33%) followed by German shepherd (31.37%) and Doberman (17.65%). This increased incidence in pure breed population could be attributed to total number of dogs in each breed in an area[8].

The mean age of mammary tumour occurrence was 9.45 years with an age range of 2.0 to 17 years. The incidence of mammary tumours increased drastically from 6 years to 12 years of age and decreased thereafter [1, 19]. All mammary tumours were recorded in females. The occurrences of male mammary gland tumour cases were nil. Mammary tumours were mostly recorded in the caudal abdominal (37.80%) and inguinal mammary (34.17%) glands. This is in accordance to previous reports of increased incidence in caudal pair of glands [8, 11]. The increased frequency in the last two glands is unknown; however, it might be due to presence of larger mass of tissue, or greater proliferative change in response to oestrogen in the most caudal glands [9].

In the present study, 94.73 per cent females were intact and 45.61 per cent dogs were whelped at least once indicating that intact bitches were at high risk of acquiring mammary tumours. The effect of neutering at young ages might be related at least in part to the resultant under development of the breasts and thus a smaller amount of susceptible tissue at risk to etiological factors [16].

In this study, three cases were in stage I, seven in stage II, 40 in stage III and 7 in stage IV. Out of these, 5 cases died all were in stage IV indicating high mortality rate in stage IV. Two cases had recurrence which was in grade III which confirms with reports of other researchers that tumours in stage III and IV showed poor prognosis[1, 11, 13, 17, 18].

CONCLUSION

Among the pure breeds, Spitz was commonly affected followed by German shepherd and Doberman. The mean age incidence was 9.45 years with an age range of 2 to 17 years. The maximum number of mammary tumours occurred between 9-12 years of age determining a possible cancer age. Intact bitches were commonly affected than neutered animals. Posterior pair of glands was commonly affected with the highest incidence in caudal abdominal mammary glands followed by inguinal. NAF, FNAB and histopathology are vital method for early diagnosis of malignancy. TNM clinical staging, Elston and Ellis Grading method could be used to ascertain the prognosis of the animal.

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ABBREVIATIONS

μm	-	micrometer
FNAB	-	Fine needle aspiration biopsy
GSD	-	German Shepherd
H&E	-	Haematoxylin and Eosin
NAF	-	Nipple aspirate fluid
Sq.C.C.	-	Squamous Cell Carcinoma
TAC	-	Tubular Adenocarcinoma
TNM	-	Tumour, Node, Metastasis
WHO	-	World Health Organization

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