

## Occurrence of Canine Mammary Tumours in Wayanad District, Kerala

Tamilvani, P<sup>1\*</sup>, Anoopraj, R<sup>2</sup>, Ajith Jacob George<sup>3</sup>, Pradeep, M<sup>4</sup>, Muhasin Asaf, V. N<sup>5</sup>, Hamza Palekkodan<sup>4</sup>, Dhanush Krishna, B<sup>4</sup>, and Athira P. Nair<sup>1</sup>

Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Pookode - 673576

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### Abstract

The present report details the occurrence of canine mammary tumours presented at Teaching Veterinary Clinical Complex, Pookode during a period of one year. Among the 22 proliferative growths from the mammary region studied, the number of hyperplastic proliferation and malignant neoplasms was one and 21, respectively. Most of the female dogs (90.9%) with mammary tumours were sexually intact. The highest occurrence of tumours was observed in the age group between 9 to 12 years (54.55%). Nearly, three-fourth (72.73%) of mammary tumours were observed in pure-bred dogs. Grossly, canine mammary tumours exhibited a diverse range of external appearances regarding shape, size, colour and consistency. Single as well as multiple gland involvements were noticed. Glands of the caudal region, particularly the inguinal (36.36%) and caudal abdominal gland (22.73%) were more frequently affected. Histotypes of malignant tumours in descending frequency of occurrence were carcinoma-malignant myoepithelioma, tubulopapillary carcinoma, carcinosarcoma, carcinoma arising from benign mixed tumour (CABMT), solid carcinoma, malignant myoepi-

thelioma, intraductal papillary carcinoma, comedocarcinoma and micropapillary invasive carcinoma. Among malignant tumours, 66.67%, 23.81% and 9.52% tumours were assigned to low-grade, intermediate-grade and high-grade, respectively.

**Key words:** Kerala, Dogs, Mammary tumours, Occurrence

Cancer is a primary contributor to global mortality, with nearly 10 million fatalities recorded in 2020, representing nearly one out of every six deaths. Cancer deaths in women are mainly due to breast cancer (15.5%), followed by lung (13.7%) and colorectum (9.5%) (Sung *et al.*, 2021). Canine mammary tumours (CMTs) constitute about 50 to 70% of all tumours in intact bitches, of which almost half are malignant. The prevalence of mammary tumours is three times higher in intact bitches compared to women (Vazquez *et al.*, 2023). This paper presents the data on the occurrence of mammary neoplasms in dogs presented for a period of one year.

### Materials and Methods

The current study included proliferative growths from the mammary region of 22 dogs presented at the Teaching Veterinary Clinical Complex (TVCC), College of Veterinary and Animal Sciences (CVAS), Pookode, Wayanad, Kerala from January 2023 to December 2023. Clinical data (age, breed, sex, reproductive status) of the dogs and gross descriptions (size, shape, colour, consistency, location) of the mammary growths were recorded. After surgical removal of the masses, the representative tissue samples

\*Corresponding author : Email : tamilvani.p@gmail.com

<sup>1</sup>M.V.Sc. Scholar, Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Pookode - 673576

<sup>2</sup>Assistant Professor, Department of Veterinary Pathology, College of Veterinary and Animal Science, Mannuthy - 680651

<sup>3</sup>Professor and Head, Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Pookode - 673576

<sup>4</sup>Assistant Professor, Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Pookode - 673576

<sup>5</sup>Assistant Professor, Department of Animal Breeding and Genetics, College of Veterinary and Animal Sciences, Pookode - 673576

were processed at the department of Veterinary Pathology, CVAS, Pookode. The tissue specimens were fixed in 10% neutral buffered formalin, processed as per standard protocol, embedded in paraffin and tissue sections were taken on microscopic glass slides, stained with routine hematoxylin and eosin stains. The proliferative mammary lesions were classified into distinct histotypes based on Goldschmidt *et al.* (2011). The malignant neoplasms were graded according to the criteria outlined by Meuten (2017).

**Results and Discussion**

Out of 22 tissue specimens analysed, 21 cases (95.45 %) were malignant and one case (4.55 %) exhibited hyperplastic changes. A similar incidence rate of more than 90 per cent malignant neoplasms was given by Kavya (2020). A less similar incidence was observed by Shafiee *et al.* (2013), Pastor *et al.* (2018) and Rodigheri *et al.* (2023) who observed around 86 to 88% malignant tumours and 12 to 13% benign tumours. Our results are in disagreement with Salas *et al.* (2015) who reported 30 to 50% incidence of malignant tumours among canine mammary tumours. The observed disparity among the authors might be attributed to the limited number of samples and the short duration of the study.

In our study, no male dogs were noted to have mammary tumours. Many authors reported that the involvement of only female dogs in their investigations (Devarathnam *et al.*, 2012; Kavya, *loc cit*; Kumar and Parasar, 2020). But, less than 6% involvement of male dogs in mammary tumours is not uncommon (Ramesh *et al.*, 2019; Tkaczyk-Wlizlo *et al.*, 2023). Females

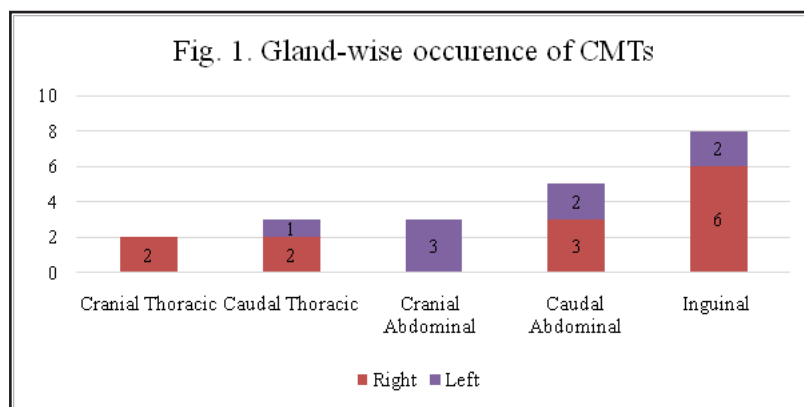
are prone to mammary neoplasms due to estrogen and progesterone, which can induce cell proliferation (Telang *et al.*, 1997). Among the female dogs, 9.52% (2/21) were spayed. These dogs might have been spayed at an older age, since only neutering at an earlier age before breeding reduces the risk of mammary tumour development (Beaudu-Lange *et al.*, 2021).

Adult dogs (9 - 12 years) showed the highest incidence (57.14%) of mammary tumours, followed by middle-aged (5 - 8 years) dogs. After middle age, the so-called onset of 'cancer age' starts in dogs and hence the incidences of mammary neoplasms also increase after 5 or 6 years.

Approximately three-fourths (71.42%) of mammary tumours occurred in pure-breds, while one-fourth (28.57%) of neoplasms were present in non-descriptive dogs. Pure-bred dogs are more prone to develop mammary neoplasms than non-descriptive dogs (Nithya *et al.*, 2018). Many times, the frequency of mammary neoplasms in pure-bred dogs varies with the geographical regions and existing breeds.

Gland-wise occurrence of canine mammary neoplasms is illustrated in Fig.1. Mammary glands of the caudal region (inguinal – 38.10 % (8/21); caudal abdominal – 23.81 % (5/21)) were affected more often, due to their greater glandular mass (Ariyaratna *et al.*, 2018; Kavya *et al.*, *loc cit*). Multiple gland involvement is also not an uncommon feature of mammary tumours (Kumar and Parasar, *loc cit*).

The distribution of canine mammary neoplasms based on tumour histotypesis illus-



**Table I.** Tumour-wise occurrence

<b>Tumour histotype</b>	<b>Number of cases (%)</b>			
Hyperplasia / Dysplasia				
Lobular hyperplasia with atypia	<b>1</b>			
<b>Malignant neoplasms</b>	<b>Grade I</b>	<b>Grade II</b>	<b>Grade III</b>	<b>Total</b>
Carcinoma - Tubulopapillary	1	4	0	5
Carcinoma–micropapillary invasive	0	1	0	1
Carcinoma–solid	0	2	0	2
Comedocarcinoma	0	1	0	1
Carcinoma and malignant myoepithelioma	4	4	0	8
Malignant myoepithelioma	0	0	1	1
Carcinosarcoma	0	2	1	3
Total no. of malignant neoplasms	5	14	2	21
Total no. of cases	22			

trated in Table I. One case of atypical hyperplasia was observed. Carcinoma and malignant myoepithelioma (38.10%; 8/21), followed by tubulopapillary carcinoma (23.81%; 5/21) and carcinosarcoma (14.29%; 3/21) were the frequent histotypes present in malignant tumours. Raval *et al.* (2018) found that adenocarcinomas and mixed mammary tumours showed an equivalent frequency in cases of malignant mammary tumours in dogs. Devarathnam *et al.* (2021) observed adenocarcinoma more commonly followed by malignant mixed tumours. In our study carcinomas were more frequently present. No case of individual sarcomas was observed except for carcinosarcomas. Dash *et al.* (2020) also reported a large number of carcinomas but they also observed sarcomas like hemangiosarcoma, fibrosarcoma and osteosarcomas. Increased occurrence of carcinoma and malignant myoepithelioma and carcinosarcoma implies that any kind of cell population in the mammary gland can progress to multiply to initiate tumour

progression and many histotypes of tumours including carcinoma, sarcoma and carcinosarcoma occur due to metaplastic changes in cells.

The majority of the malignant mammary tumours were categorised as intermediate grade (66.67%; 14/21), followed by low grade (23.81%; 5/21) and high grade (9.52%; 2/21) according to the criteria of Pena *et al.* (2013). Kavya (*loc cit*) also employed the same criteria for grading and obtained similar results. But Ariyaratna *et al.* (*loc cit*) observed more number of Grade 1 tumours based on the above-outlined criteria. These variations in the frequency of each grade tumour were attributed to varied sampling numbers. Moreover, the criteria insisted were sometimes based on subjective evaluation which is prone to more bias based on the pathologists. However, in high-grade tumours regardless of the grading system used, the chance for metastasis increases and the prognosis worsens with increased recurrence and decreased survival rate.

## Conclusion

The present study, unveiled that the majority of the mammary tumours were malignant, which might have high metastatic potential leading to poor prognosis. Despite all the treatment modalities like surgical excision and chemotherapy, prevention can be the best strategy to save the pet's life. Since intact female dogs are showing a higher tendency to develop mammary tumours. Spaying at the first or second heat before breeding should be considered.

## References

- Ariyaratna, H., De Silva, N., Aberdein, D., Kodikara, D., Jayasinghe, M., Adikari, R. and Munday, J.S. (2018). Clinicopathological diversity of canine mammary gland tumours in Sri Lanka: A one-year survey on cases presented to two veterinary practices. *Veterinary Science*. **5**: 46.
- Beaudu-Lange, C., Larrat, S., Lange, E., Lecoq, K. and Nguyen, F. (2021). Prevalence of reproductive disorders including mammary tumors and associated mortality in female dogs. *Veterinary Science*. **8**: 184.
- Dash, S., Singh, C. and Singh, N. (2020). Studies on Prevalence of Mammary Gland Tumors of Female Dogs in Ludhiana (Punjab). *International Journal of Livestock Research*. **10**: 235-242.
- Devarathnam, J., Suresh Kumar, R.V., Bharathi, S. and Anand Kumar, A. (2021). Epidemiological studies of canine mammary gland tumours. *The Pharma Innovation Journal*. **10**:13-17.
- Goldschmidt, M., Peña, L., Rasotto, R. and Zappulli, V. (2011). Classification and grading of canine mammary tumours. *Veterinary Pathology*. **48**:117-131.
- Kavya, M., Sajitha, I.S., Anoopraj, R., Anoop, S. and Ajith, J.G. (2020). Occurrence and histopathological classification of canine mammary tumours in Wayanad, Kerala. *The Pharma Innovation Journal*. **9**: 220-223.
- Kumar, P. and Parasar, M.C. (2020). Occurrence of mammary tumour in dogs. *Journal of Agricultural Research Advances*. **2**: 29-32.
- Meuten, D.J. 2017. *Tumours in Domestic Animals*. (5th Ed.). Iowa State Press, Iowa, 735p.
- Nithya, P., Vairamuthu, S. and Balachandran, C. (2018). Factors influencing the occurrence of mammary gland tumours in dogs. *Indian Journal of Veterinary Pathology*. **42**: 249-253.
- Pastor, N., Caballe, N.C., Santella, M., Ezquerro, L.J., Tarazona, R. and Duran, E. (2018). Epidemiological study of canine mammary tumours: age, breed, size and malignancy. *Austral Journal of Veterinary Sciences*. **50**: 143-147.
- Pena, L., Andres, P.D., Clemente, M., Cuesta, P. and Perez-Alenza, M.D. (2013). Prognostic value of histological grading in noninflammatory canine mammary carcinomas in a prospective study with two-year follow-up: relationship with clinical and histological characteristics. *Veterinary Pathology*. **50**: 94-105.
- Ramesh, R., Theophilus, C., Kumar, A., Balachandran, C., Thangapandiyam, M. and Shafiuza, M. (2019). Influence of gender and reproduction status on the prevalence of canine mammary tumours. *Indian Veterinary Journal*. **96**: 73-75.
- Raval, S.H., Joshi, D.V., Parmar, R.S., Patel, B.J., Patel, J.G., Patel, V.B., Ghodasara, D.J., Chaudhary, P.S., Kalaria, V.A. and Charavada, A.H. (2018). Histopathological classification and immunohistochemical characterisation of canine mammary tumours. *Indian Journal of Veterinary Pathology*. **42**: 19-27
- Rodigheri, S.M., Paiva, F.N., Firmo, B.F., Fuchs, T., Mani, C.B. and Nardi, A.B. (2023). Parameters of Metabolic Response to Surgical Trauma Induced via Unilateral Total Mastectomy Associated or Not to Ovariohysterectomy in Dogs. *Animals*. **13**: 926.
- Salas, Y., Márquez, A., Diaz, D. and Romero, L. (2015). Epidemiological study of mammary tumours in female dogs diagnosed during the period 2002-2012: A growing animal health problem. *PLoS ONE*. [On line] **10**: 1–15. Available: <https://doi.org/10.1371/journal.pone.0127381>. [25 Oct.2023].
- Shafiee, R., Javanbakht, J., Atyabi, N., Kheradmand, P., Kheradmand, D., Bahrami, A., Daraei, H. and Khadivar, F. (2013). Diagnosis, classification and grading of canine mammary tumours as a model to study human breast cancer: anClinico - Cytohistopathological study with environmental factors influencing public health and medicine. *Cancer Cell International*. **13**: 1-11.
- Sung, H., Ferlay, J., Siegel, R.L., Laversanne, M., Soerjomataram, I., Jemal, A. and Bray, F. (2021). Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *A Cancer Journal for Clinicians*. **71**: 209-249.
- Telang, N.T., Katdare, M., Bradlow, H.L. and Osborne, M.P. (1997). Estradiol metabolism: an endocrine biomarker for modulation of human mammary carcinogenesis. *Environmental Health Perspectives*. **105**:559-564.
- Tkaczyk-Wlizio, A., Smiech, A., Kowal, K., Rozanska, D. And Slaska B. (2023). Histopathological evaluation of canine mammary gland tumours: a study of 92 cases. *Med Weterinaryjnna*. **79**:6771–2023.
- Vazquez, E., Lipovka, Y., Cervantes-Arias, A., Garibay-Escobar, A., Haby, M.M., Queiroga, F.L. and Velazquez, C. (2023). Canine Mammary Cancer: State of the Art and Future Perspectives. *Animals*. **13**:3147.