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A Study of Occurrence, Gross and Histopathological Characteristics of Canine Cutaneous Neoplasms

Raimon Mathew, I.S. Sajitha, Sudheesh S. Nair,
B. Dhanush Krishna, S.S. Devi, Mammen J. Abraham

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ABSTRACT

The present work was undertaken to study the occurrence along with the gross and histopathological features of canine cutaneous neoplasms in and around Thrissur. A total of 17 tumour samples were examined during the study. The mean age of the dogs affected with tumours was 6.55±0.59 years. The occurrence was slightly higher in males, but there was no association (p>0.05) between the sex and occurrence of skin tumours. Among the various breeds, Labradors were more affected with these tumours. Grossly, most of the tumours were round to oval in shape with soft to firm consistency and greyish white colour. Histopathological examination confirmed majority of the tumours as benign with more number of epithelial/melanocytic tumours.

Key words: Cutaneous neoplasm, Dog, Histopathology.

INTRODUCTION

Skin is the largest organ of the body and is most commonly affected with tumours in canines (Bastianello, 1983). Dogs are said to develop tumours twice as frequently as humans (Rungsipipat *et al*., 2003). The high incidence of skin tumours in dogs could be due two factors, firstly the skin is continuously exposed to various physical, chemical and other environmental insults and secondly the cutaneous neoplasms are easily identified in their initial stages (Guzman *et al*., 2003). Various surveys conducted in different countries have shown regional variations in the prevalence and type of skin tumours that develop in canines. The variations are attributed to regional differences in the exposure to environmental carcinogens and differences in popularity of breeds (Mukaratirwa *et al*., 2005). Cutaneous tumours in dogs are easily noticed by owner and hence they are brought to the attention of the veterinarian very soon. As surgical removal is fairly easy, they are frequently submitted for histopathology. The present study was undertaken with the objective to classify the canine cutaneous tumours and examine their histological features.

MATERIALS AND METHODS

Excision biopsy samples from dogs with skin tumours presented to Kerala Veterinary and Animal Sciences University Veterinary Hospitals, Mannuthy and Kokkalai during the period from January 2018 to March 2019 were collected for the study. Seventeen cutaneous tumour specimens were examined. The samples were fixed in 10 per cent neutral buffered formalin (NBF), processed, sectioned and stained with haematoxylin and eosin. Statistical analysis was carried out using the software SPSS version 24. Fisher's exact test was used to find out the relationship between categorical variables.

College of Veterinary and Animal Sciences, Mannuthy-680 651, Kerala, India.

Corresponding Author: Raimon Mathew, College of Veterinary and Animal Sciences, Mannuthy-680 651, Kerala, India.
Email: mathew.raimon@gmail.com

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RESULTS AND DISCUSSION

The gross pathological features and the classification of the tumours observed during the study are presented in Table 1. Grossly, most of the tumours were round to oval in shape with soft to firm consistency and greyish white colour. The majority (47.06 per cent) of the tumours were seen in the age group of 7 to 9 years with a mean age of 6.55±0.59 years. It was noticed that the occurrence of superficial tumours was slightly more in male dogs (58.82 per cent) than females (41.18 per cent). Among the observed conditions, sebaceous adenoma, myxosarcoma, hepatoid adenoma, squamous cell carcinoma and haemangioma were seen in males where as fibroma, trichoepithelioma, melanocytoma and fibrosarcoma were reported in females. Lipoma and trichoblastoma were observed in both males and females. Although, in the present study, different breeds have been affected with skin tumours, the highest occurrence was observed in Labradors (41.18 per cent). The majority (76.47 per cent) of the tumours were found to be benign in nature. Out of all the tumours 58.82 per cent were epithelial and melanocytic in origin (sebaceous adenoma, trichoblastoma, trichoepithelioma, hepatoid adenoma, squamous cell carcinoma and melanocytoma)

and 41.18 per cent were of mesenchymal origin (fibroma, lipoma, haemangioma, fibrosarcoma and myxosarcoma).

It was seen in the current study that middle aged dogs were more susceptible to cutaneous tumours. This finding is in agreement with Babu *et al*. (2012) who reported the highest incidence of tumours in dogs in the age group of 5 to 8 years followed by 9 to 12 years. As far as the influence of sex is concerned, though males were more affected in this study, there was no association between the sex and occurrence of superficial tumours ($p>0.05$) which is consistent with the report of Mukaratirwa *et al*. (2005). According to Sharma *et al*. (2018), among the various breeds of dogs, the highest incidence (34%) of skin tumours was seen in Labradors whereas Babu *et al*. (2012) observed a higher incidence in German Shepherds. Kaldrimidou *et al*. (2002) concluded that the chances of developing a skin tumour in a pure breed dog were two times higher than in mongrels and crossbreds. The present study also showed the highest occurrence of skin tumours in Labradors. Thus, it could be inferred that purebred dogs have a higher predisposition to skin tumours compared to crossbreds. Among the various subtypes of purebred dogs, no specific breed predilection for skin tumours has been established in the literature, which could be attributed to the variation in sample size and popularity of any particular breed in a geographical area.

Majority of the tumours in this study were benign. It was in agreement with Babu *et al*. (2012) and Kashyap *et al*. (2013) who have reported that canine skin tumours were mostly benign. Sanja *et al.* (2005) observed that epithelial and melanocytic tumours of the skin were the most common skin tumours in dogs. In the present study also, the tissue of origin of majority of the tumours was epithelial and melanocytic. Among the epithelial tumours observed in the current study, 50 per cent were hair follicle tumours (trichoblastoma and trichoepithelioma). As per Simkus *et al*. (2016) there were variations in the prevalence of common canine skin neoplasms among reports published from different countries which could be a reflection of the canine breed population. Chikweto *et al*. (2011) opined that the possible environmental risk factors for canine skin tumours were increased exposure to ultraviolet light due to year round warm humid climate and heavy load of ectoparasites and associated dermatitis in many dogs. In the present study no evidence of photo dermatitis or heavy load of ectoparasites could be seen. Though the present study was successful in identifying the various tumour types reported, it is not possible to draw a conclusion on the most prevalent canine skin tumour in this area. An exhaustive epidemiological study for long duration with large number of samples might be helpful to throw some light on the incidence pattern of these tumours and probable reasons. The various features of tumours identified during the study are discussed below:-

Trichoblastoma

Three cases of trichoblastoma were examined during the study. The size varied from 5 to 8 cm. Two masses were observed on the forehead and one on the neck. They were well encapsulated with round to oval shape and firm consistency. The cut surface showed greyish white colour. These findings were in accordance with Sawale *et al*. (2015). Microscopically the tumours were multilobulated with ribbon type cords of branching and anastomosing cells. The cells showed a palisaded appearance having scant eosinophilic cytoplasm and prominent hyperchromatic nuclei with inconspicuous nucleoli. Scattered atypical mitotic figures were seen in moderate numbers. Moderate quantity of stroma was seen between the cords of cells (Fig 1). These findings were in consonance with Campos *et al*. (2014).

Table 1: Classification and gross pathological features of canine skin tumours.

Type	No. of cases	Breed, Sex (M/F), Age (yrs)	Location, shape, size (cm), consistency, colour
Benign Tumours			
Trichoblastoma	3	Labrador, M, 8, Non-descript, M, 3 and German shepherd, F, 7	Forehead (02 cases) & neck (01 case), round, 5-8 cm, firm, greyish white
Trichoepithelioma	2	Labrador, F, 9 and German shepherd, F, 9	Lumbar area (both), round, 4-5cm, soft, greyish white
Lipoma	2	Crossbred, M, 8 and Labrador, F,5	Abdomen (both cases), round, 4-7cm, soft, white
Sebaceous adenoma	1	Dachshund, M, 02	Forelimb, oval, 7cm, firm, greyish white
Fibroma	1	Rottweiler, F, 05	Right thigh, round, 3cm, firm, greyish brown
Hepatoid gland adenoma	1	Dachshund, M, 4	Perineum, irregular, 4cm, soft, greyish white
Melanocytoma	1	Rottweiler, F, 4	Left forelimb digit, round, 3cm, firm, black
Haemangioma	2	Labrador, M, 7 and Non-descript, M, 10,	Left thigh & abdomen, oval, 3cm, firm, red
Malignant Tumours			
Myxosarcoma	1	Labrador, M, 8	Left thigh, irregular, 6cm, firm, reddish white
Fibrosarcoma	1	Labrador, F, 10	Vulva, round, 5 cm, hard, white
Squamous cell carcinoma	2	Rottweiler, M, 6 and Labrador, M, 7	Left forelimb digit & eyelid, irregular, 3-4cm, hard, reddish brown

Trichoepithelioma

Two cases of trichoepithelioma were studied. Both the growths were observed on the dorsum which were ulcerated and well demarcated. The masses were 4 to 5 cm in size with round shape and soft consistency. The cut section showed greyish white granular tissue. Beck *et al*. (2016) observed that the most common site of trichoepithelioma was the back and the tumours were presented as nodules or warts with alopecia and ulceration with an average size was 3.75 cm. Histologically the tumours were composed of cysts filled with keratinous debris (Fig 2). The basal lamina was thickened and eosinophilic, with palisaded cells having little cytoplasm and hyperchromatic nuclei. Towards the centre of the cyst, extensively keratinised cells were observed. These findings were similar to that reported by Raval *et al*. (2015).

Lipoma

Lipomas were non-encapsulated soft round masses on the abdomen. The cut surface had white colour and greasy texture resembling fat as reported by Simeonov *et al*. (2011). Microscopically they were characterised by proliferating adipocytes which had single, clear and large cytoplasmic vacuole with the nuclei compressed to the periphery (Fig 3) as described by Leriquier *et al*. (2017).

Sebaceous adenoma

It was identified as an oval mass on the forelimb with firm consistency. The cut surface was solid with greyish white colour. Microscopically the sebaceous cells were arranged in multiple lobules, separated by connective tissue trabeculae (Fig 4). The lobules had two types of cells, peripherally located undifferentiated generative (peripheral basaloid) cells and centrally located sebaceous cells showing varying degrees of sebaceous differentiation (vacuolization in the cytoplasm) as observed by Ozyigit *et al*. (2005). Mitotic figures and cellular pleomorphism were not prominent.

Fibroma

It was seen as a round subcutaneous mass on the right hind limb with firm consistency and white colour on cut

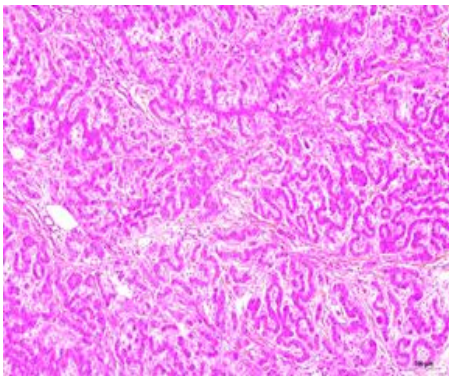

Fig 1: Ribbon type trichoblastoma. Long anastomosing cords of neoplastic epithelial cells arranged in a ribbon pattern (H&Ex100).

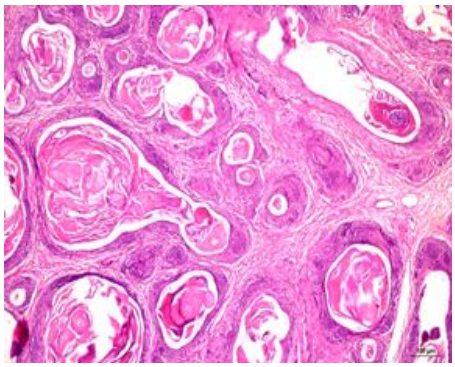

Fig 2: Trichoepithelioma-cystic type. Multiple cysts filled with keratinous debris (H&Ex100).

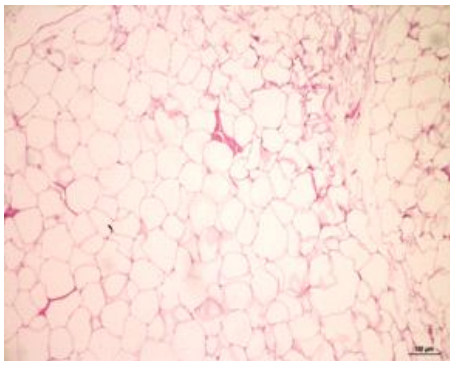

Fig 3: Lipoma. Neoplastic adipocytes with single, clear and large cytoplasmic vacuole and the nuclei compressed to the periphery (H&Ex100).

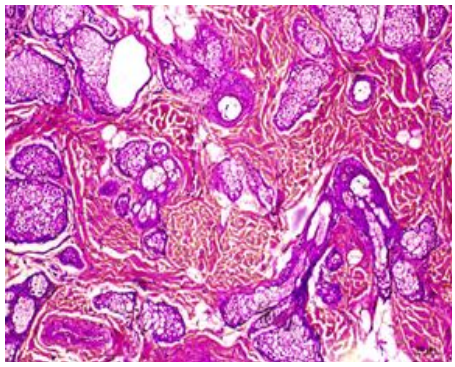

Fig 4: Sebaceous adenoma. Neoplastic cells arranged in multiple lobules and separated by connective tissue trabeculae (H&Ex100).

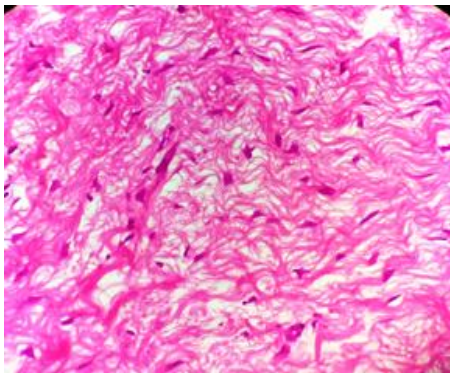

Fig 5: Fibroma. Fibrous connective tissue with spindle-shaped and stellate fibroblasts (H&Ex200).

surface. Microscopically it was composed of spindle-shaped and stellate fibroblasts (Fig 5) whose nuclei were oval, normochromatic and without mitotic figures. Abundant extracellular collagenous stroma was also seen as reported by Behera *et al*. (2014).

Hepatoid gland adenoma

It was observed as a solitary pedunculated mass in the perineal region. The cut surface was soft and greyish white in colour with focal hemorrhages. Histologically it was characterised by cords of cells with similarity to normal hepatocytes with abundant eosinophilic cytoplasm and centrally placed, large vesicular and normochromatic nuclei (Fig 6). Basaloid reserve cells with scant cytoplasm and hyperchromatic nuclei, at the periphery of the lobules were characteristic. The morphological and microscopical findings were in agreement with Goldschmidt and Goldschmidt (2017) who observed that most of hepatoid gland neoplasms (88 per cent) were seen in the perineal region with size varying from 0.5 to 5 cm.

Melanocytoma

It was observed as a 3 cm sized round ulcerated mass with firm consistency and black colour in the interdigital space of the left forelimb. Goldschmidt and Goldschmidt (2017) observed that melanocytomas varied in size from small macules to large masses with almost 5 cm size and varying colour from black through shades of brown or grey depending on the quantity of melanin pigment within the neoplastic cells. Microscopically it had abundant quantity of melanin pigment in the cytoplasm of neoplastic melanocytes, which obscured the nuclear morphology (Fig 7). These characteristics are similar to that observed by Abuseida *et al*. (2008).

Haemangioma

Two cases of haemangioma have been studied. The growths were 3cm sized with red colour and soft to firm consistency. The cut surface also was red in colour with blood oozing out. Microscopically the tumours had widely dilated and variable sized vascular spaces filled with erythrocytes (Fig 8) and a clear fibrous connective tissue stroma, infiltrated by inflammatory cells, separating the vascular channels. Organised thrombi with foci of haemosiderosis were also found in the tumour. These findings are in accordance with Sasani *et al*. (2015).

Myxosarcoma

It was seen as multiple subcutaneous firm movable swellings on the left thigh. Surgical excision revealed four well encapsulated masses of irregular shape. Cut surface was soft and greyish white in colour with oozing of sticky fluid as observed by Hendrick (2017). Histopathologically it was characterised by proliferation of spindle shaped fibroblasts bathed in an abundant myxoid matrix which stained blue (Fig 9) as reported by Headley *et al*. (2011). The neoplastic cells had indistinct cellular margins with marked cellular and nuclear pleomorphism. The high nuclear density was a

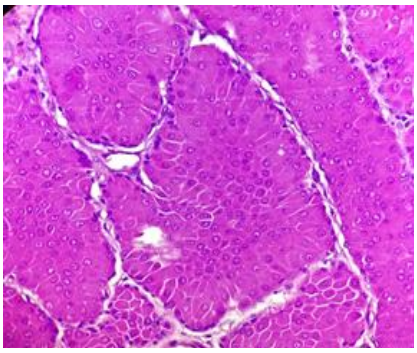

Fig 6: Hepatoid adenoma. Cords of cells with similarity to normal hepatocytes (H&Ex200).

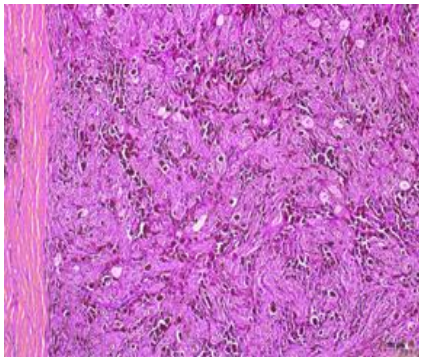

Fig 7: Melanocytoma. Presence of abundant quantity of melanin pigment in the cytoplasm of neoplastic melanocytes (H&Ex100).

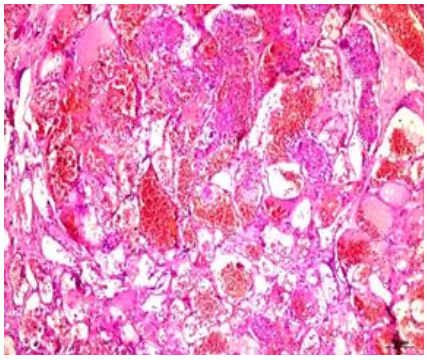

Fig 8: Haemangioma. Widely dilated and variable sized vascular spaces filled with erythrocytes (H&Ex100).

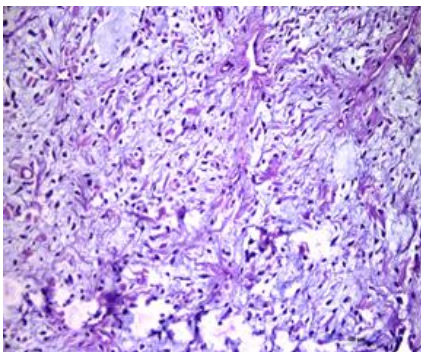

Fig 9: Myxosarcoma. Spindle shaped fibroblasts bathed in an abundant myxoid matrix (H&Ex100).

reliable observation for differentiating it from myxoma since the variation in other features among them is subtle.

Fibrosarcoma

The case of fibrosarcoma appeared as hard, round and solid mass protruding out of the vagina. Histologically it was characterised by spindle shaped tumour cells and collagen fibers arranged in herringbone pattern (Fig 10). These features are in agreement with the report of Al-Kenanny *et al*. (2013). Cytoplasm was scant and nuclei were elongated to oval with inconspicuous nucleoli. High nuclear density and presence of less collagen differentiated it from fibroma as described by Hendrick (2017).

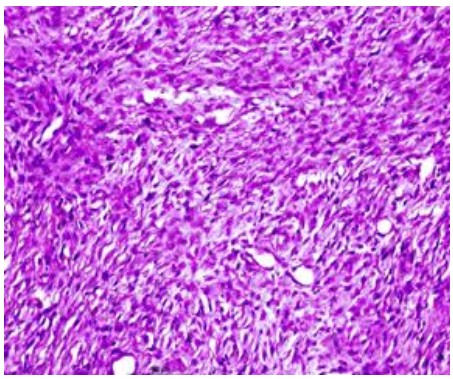

Fig 10: Fibrosarcoma. Spindle shaped tumour cells and collagen fibers arranged in herringbone pattern (H&Ex200).

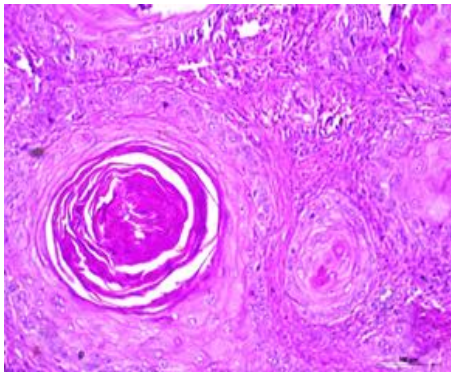

Fig 11: Well differentiated squamous cell carcinoma. Nests of neoplastic squamous cells with extensive keratosis and formation of distinct keratin “pearls” (H&Ex100).

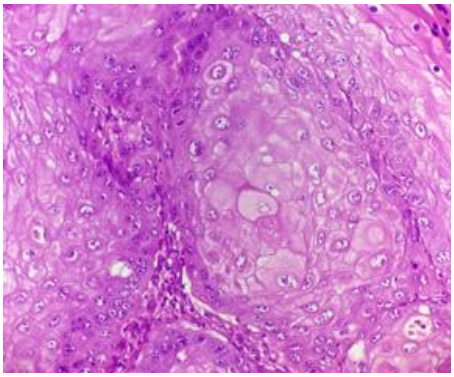

Fig 12: Less differentiated squamous cell carcinoma. Proliferating squamous epithelial cells without keratin pearl formation (H&Ex100).

Squamous cell carcinoma

Two cases of squamous cell carcinoma were studied. One was on the eye lid and the second on the digit of the left forelimb. The tumours were ulcerated, firm to hard in consistency with reddish brown colour. As per Henry *et al*. (2005) the most common tumour type diagnosed among the digital tumours in dogs was squamous cell carcinoma. Microscopically both the cases differed in the degree of differentiation. One was well differentiated characterised by nests and cords of neoplastic squamous cells with extensive keratosis and formation of distinct keratin “pearls” (Fig 11). In the less differentiated one, the neoplastic cells were smaller in size with amphophilic cytoplasm and indistinguishable keratosis (Fig 12). These findings were in conformity with the reports of Chandrashekaraiah *et al*. (2011) and Belluco *et al*. (2013).

CONCLUSION

In conclusion, histopathology, which is considered as gold standard for tumour diagnosis, has been extensively utilised in the present study for identifying the various histopathological types of canine cutaneous neoplasms for prompt follow up of the cases, especially malignant tumours. Further studies for immunohistochemical characterization of the tumours might be of help to confirm the tissue of origin of the tumours and to rule out epithelial mesenchymal transition (EMT) which is consistent with malignant transformation of the tumour.

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