

*Full Length Research Paper*

# Cutaneous and subcutaneous tissue neoplasms in canines: Occurrence and histopathological studies

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Accepted 4 December, 2013

The present investigation was carried out to study the occurrence and histopathology of spontaneously occurring tumours in skin and subcutaneous tissues in canines. A total of 32 grossly suspected cases of spontaneously occurring cutaneous and subcutaneous tumours were collected during the period from October 2010 to September 2011 in canines of Durg district and adjoining areas of Chhattisgarh to detect the prevalence based on age, sex, breed, and site on the body. Out of these 25 cases were confirmed as tumours based on histopathological findings. The results revealed that, the dogs had higher prevalence (56%) than bitches (44%). Geriatric dogs (32%) were found to be affected more with various neoplastic conditions. Pomeranian breed showed highest prevalence (32%) followed by Spitz (28%). Histopathologically, 10 cases were malignant (40%) in nature and included basal cell carcinoma, squamous cell carcinoma, rhabdosarcoma, tubulo-papillary adenocarcinoma, venereal granuloma, and fibrosarcoma. Moreover, the other 15 (60%) neoplastic cases were benign in nature and included fibroma, histiocytoma, fibroadenoma and leiomyoma. The overall mean ages for benign and malignant tumours were 10 years and 6.79 years, respectively.

**Key words:** Benign, malignant, skin, canines, prevalence, histopathology

## INTRODUCTION

The rapid development of the scientific field has not only combated canine disease but also has increased the longevity and quality of life. Invention of advanced techniques has helped in prevention and control of infectious diseases resulting in more dogs living to the advanced ages (Krithiga et al., 2005). The cancer is a life threatening ailment and said to be a silent killer. Various neoplasms have gained importance in pet animals due to the affection and increased awareness among the people towards the sufferings and pain caused to the speechless animals. Incidence of neoplasms in pet animals is difficult to ascertain. Among all the tumours the occurrence of skin and mammary tumors had been the highest in canines (Reddy et al., 2009). Canines are said to develop neoplasms twice as frequently as humans (Rungsipipat et al., 2003). The skin is the most common anatomical

location of neoplasms and holds between 9.5 and 51% of all tumours in dogs. A wide range of tumour types can be found in the skin, subcutaneous tissue, and adenexia (Louise et al., 2010). The present investigation is aimed to provide data on prevalence and histopathological diagnosis of skin and subcutaneous tissue neoplasms in canines.

## MATERIALS AND METHODS

### Study area and data collection

The present study was conducted on spontaneously occurring cutaneous and subcutaneous tumours in canines of Durg district and adjoining areas of Chhattisgarh to detect the prevalence based on age, sex, breed and site on the body. A total of 22 grossly

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suspected cases of spontaneously occurring cutaneous and subcutaneous growths at various sites were collected with detailed anamnesis during the period from October 2010 to September 2011 at the Teaching Veterinary Clinical Complex (TVCC) and Department of Veterinary Surgery and Radiology, College of Veterinary Science and A. H., Anjora, Durg (India). Some of the cases were also referred from various Private Clinics and the Government Veterinary Hospitals of adjoining parts of Chhattisgarh state.

### Surgical procedure involving lumpectomy

Owners were advised to withhold food for 12 h and water for 6 h prior to the surgical procedures. Ethical consideration were given due priority to minimize the pain and sufferings of the animals. The dogs were pre-medicated with atropine sulphate (0.04 mg/kg body weight, intramuscularly) and sedated using xylazine (1 mg/kg body weight, intramuscularly) or medetomidine (20 µg/kg body weight, intramuscularly) 15 min prior to induction of general anaesthesia.

The area of the spontaneous growth was cleaned, shaved and scrubbed with povidone iodine. Routine aseptic precautions were observed throughout the procedure. General anaesthesia was induced and maintained intravenously with ketamine hydrochloride (5 mg/kg body weight) or propofol (5 mg/kg body weight).

The surgical techniques were performed as per Harvey (1990). An elliptical skin incision was given directly over the tumour growth, subcutaneous tissue and muscle layers were bluntly separated and the haemostasis, if any was achieved by forcipressure and/or ligation of supplying blood vessels. In cases, where the growths were well capsulated, lumpectomy included removal of the tumour mass only. However, in sessile and non-capsulated growths, a part of healthy tissues involving 1 cm at margins were also included to avoid likelihood of recurrence. The growths were removed, weighed and tissue samples were preserved directly in 10% neutral buffered formalin for histopathological studies. The surgical wound was closed by approximation of the muscle layer in simple continuous suturing pattern using chromic catgut size 1. The skin was closed with braided silk number 1 using simple interrupted or horizontal mattress sutures. Routine post operative care with antibiotics, analgesics and surgical wound dressing were performed in all the cases to ensure uneventful recovery.

### Histopathological studies

Following fixation in 10% neutral buffered formalin, the tissues were thoroughly washed in running water; dehydrated in ascending grades of alcohol; cleared in benzene and embedded in paraffin at 58°C. The paraffin embedded tissue sections of 4 to 5 µm were obtained as described by Luna (1972) and stained with haematoxylin and eosin (HE) as per the method described by Bancroft and Stevens (1990) with slight modifications. The stained sections were examined under light microscope and the lesions were recorded, if any.

## RESULTS

Out of the 22 grossly suspected cases of spontaneous growths occurred in cutaneous and subcutaneous tissues, 25 cases were confirmed as tumours based on histopathological findings and classified accordingly as carcinoma, sarcoma or benign tumours. Among these tumours 40% (10 cases) were malignant and remaining 60% (15 cases) were benign. The data pertaining to

breed, age and sex of dogs on occurrence of skin and subcutaneous neoplasms has been summarised and presented in Table 1.

The majority of the neoplastic conditions were seen in Pomeranian breed accounting for 8 (32%) cases, followed by Spitz (7 cases, 28%), German shepherd (5 cases, 20%), Mongrel dogs (2 cases, 8%) while one case each were recorded in Dobermann (4%), Boxer (4%), and Lhasa apso (4%) breeds. The results of this study also show that, sex wise a majority of the cases of skin and subcutaneous tumours were in male accounting for 14 (56%) cases as compared to those of 11 (44%) in females.

The results further indicate that, the geriatric dogs are more prone for various neoplastic conditions. The prevalence of skin and subcutaneous tumours were found in 8 (32%) dogs which were in the age group of 8 to 12 years, and lowest 4 (16%) dogs were in the age group of 0 to 4 years. Further, the mean age for occurrence of malignant tumours was found to be 6.79 years as compared to 10 years in case of benign tumours. Site wise, genital region was found to be the most commonly affected site for skin and subcutaneous tumours comprising 9 (36%) out of total skin and subcutaneous tumours. Prevalence of tumours involving mammary glands was 6 (24%), oral 3 (12%), ear 2 (8%), neck 2 (8%), tail 2 (8%) and limbs 1 (4%) out of total skin and subcutaneous tumours recorded during the study period.

Various benign and malignant tumours being recorded in this study along with their most characteristic features are as follows.

### Fibroma

The sections revealed proliferation of typically arranged fibroblast with streaming interlacing bundles running in criss-cross directions with formation of whorl at times. These features were identical to those described by Moulton (1990).

### Fibroadenoma

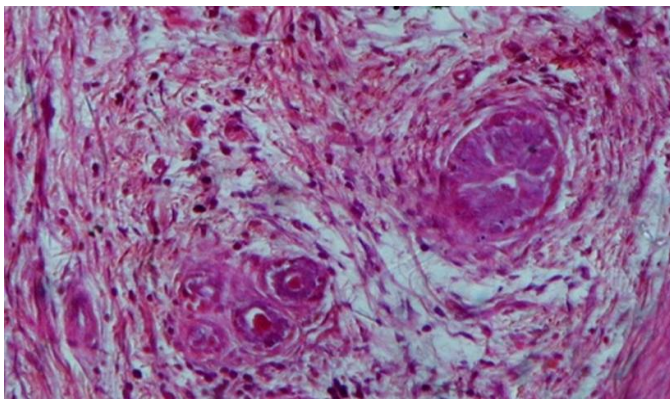
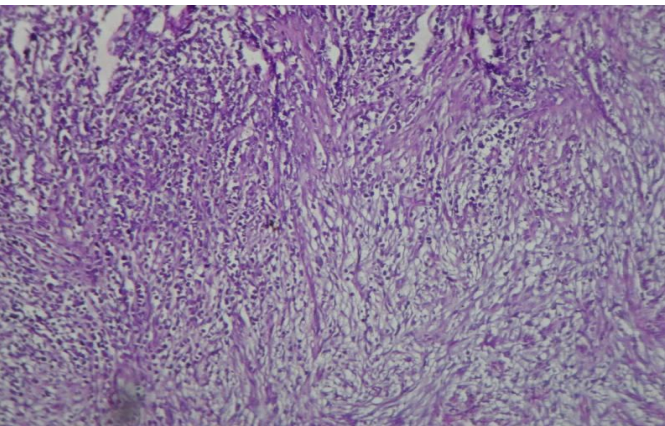
The section of fibroadenoma revealed neoplastic mass consisting of tubules lined by cuboidal or columnar cells, with round nuclei (Figure 1). More long-standing neoplasms had a denser fibrous connective tissue around the ducts and hyalinization of the stroma. This was in same line with those reported by Singh et al. (2004).

### Cutaneous histiocytoma

The section of cutaneous histiocytoma showed a sheet of densely packed round cells with oval, bean shaped

**Table 1.** Breed, age and sex wise occurrence of skin and subcutaneous tissue neoplasms in canines

Breed	Sex		Total cases	Benign tumours		Malignant tumours	
	Male	Female		No. of cases	Mean age (Years)	No. of cases	Mean age (Years)
Pomeranian	6	2	8	6	7.17	2	8
Dobermann	0	1	1	0	0	1	10
Spitz	3	4	7	4	4.25	3	9
German shepherd	2	3	5	4	12.75	1	13
Boxer	0	1	1	0	0	1	7
Lhasa apso	1	0	1	1	3	0	0
Mongrel	2	0	2	0	0	2	13
TOTAL	14	11	25	15	-	10	-

**Figure 1.** Fibroadenoma: Proliferated fibrous tissue together with hyperchromatic acinar cells. (HE × 400).**Figure 2.** Cutaneous histiocytoma: Round neoplastic cells loosely arranged towards the periphery, compactly arranged towards the deeper dermis with delicate connective tissue stroma intersection the solid cell sheet (HE × 100).

folded nuclei, eosinophilic cytoplasm, mitotic figures and scanty stroma in centre while the cells were loosely

arranged at peripheral areas (Figure 2). Similar findings have also been reported previously by Gupta and Tiwari (2009).

### Leiomyoma

Histopathology revealed fascicles of spindle cells tending to intersect each other at right angles (Figure 3). Krithiga et al. (2005) reported homogenous population of densely packed elongated cells with indistinguishable cytoplasmic borders running in different directions in leiomyoma.

### Basal cell carcinoma

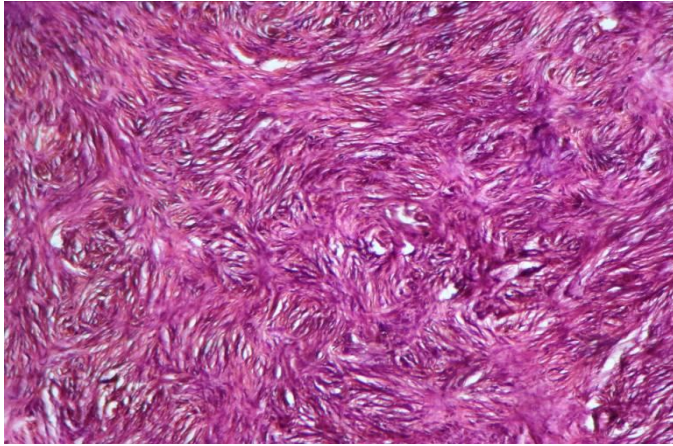
The tumor tissue presented proliferating basal epithelial cells, small and uniform in size and forming adenoid pattern in superficial dermis and solid pattern in deep dermis. The histological findings are in accordance with Reddy et al. (2009).

### Squamous cell carcinoma

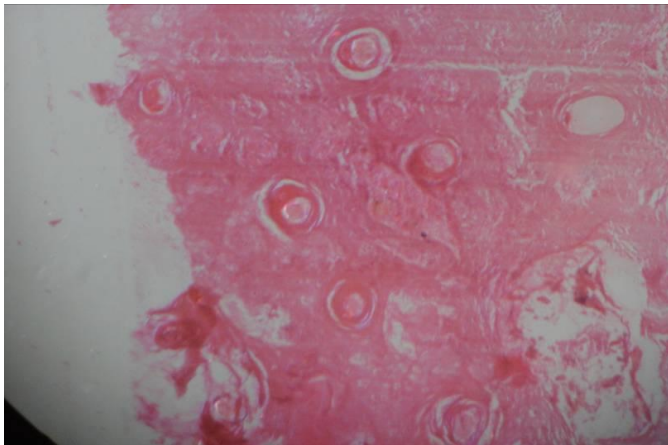
The section of squamous cell carcinoma showed epithelial cell nest with keratin pearl (Figure 4). The neoplastic squamous epithelial cells invaded deep dermis in the form of thick cellular islands and irregular cords composed of concentric layers of squamous cells with keratinization towards the centers forming keratin pearl and cell nests which are characteristic feature of squamous cell carcinoma. These findings corroborates well with those reported by Sivaseelan et al. (2009). Similar findings have also been reported by Vani et al. (2007) who diagnosed 17 squamous cell carcinoma cases out of 138 cases of tumours in canines.

### Rhabdosarcoma

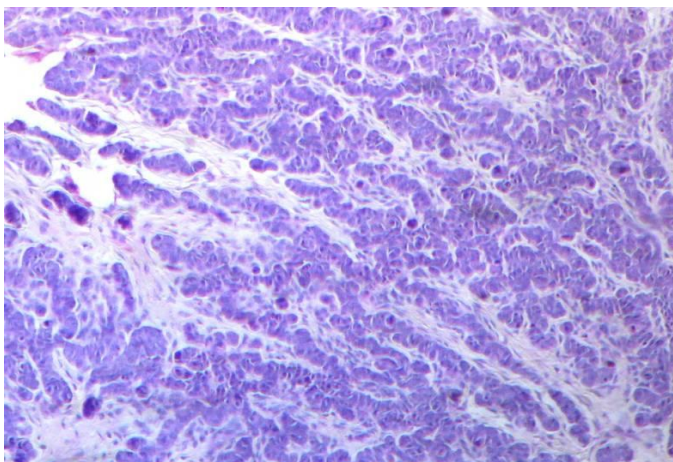
The sections revealed hyperchromatic spindle shaped



**Figure 3.** Leiomyoma: Fascicles of spindle cells tending to intersect each other at right angles. (HE × 100).



**Figure 4.** Squamous cell carcinoma: Microphotograph depicting eosinophilic epithelial pearl. (HE × 100).



**Figure 5.** Tubulo-papillary adenocarcinoma: Glandular epithelial cells with hyperchromatic nuclei, arranged in finger like projections (HE × 100).

nuclei. It was characterized by the presence of pleomorphic cells replacing the underlying connective tissue. The cells lacked cross striations (Singh et al., 2004). According to Hudlund (1993) the microscopic appearance of rhabdosarcoma is extremely variable due to rapid growth and a high mitotic index.

### **Tubulo-papillary adenocarcinoma**

The section of the adenocarcinoma revealed mitotic figures, epithelial cells with hyperchromatic nuclei in glandular fashion arranged in finger like projections (Figure 5). Size of the cell aggregates varied and at many places, the lumen of the cell aggregates was filled with the cell or with necrotic masses. The necrotic masses in the lumen were observed as homogenous structures with basophilic stain. Similar observations have been made by Karma (2007) and Dayananda et al. (2009).

### **Venereal granuloma**

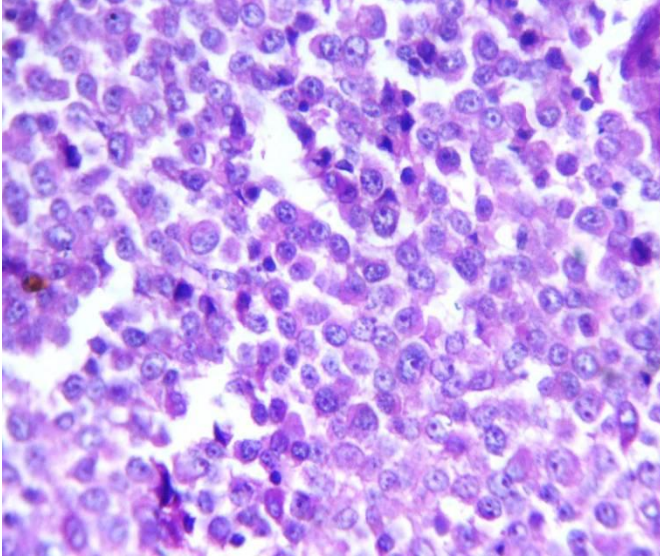
The section of venereal granuloma showed sheets of round individual cells containing round vesicular nuclei (Figure 6). According to Johnson (2007), venereal granuloma was oval or round shaped neoplastic cells consisting of oval to spherical shaped vesicular nucleus and a prominent nucleolus. Kisani and Adamu (2009) also reported sheet of large round cells resembling lymphoblast, individual neoplastic cells and their nuclei showed pronounced variation in size along with numerous mitotic figures were seen in the neoplastic cells.

### **Fibrosarcoma**

The section of fibrosarcoma showed malignant spindle cells arranged in herring bone pattern dominated by typical architectural disarray. It was characterized by the presence of numerous pleomorphic spindle cells separated by small amount of collagen as reported previously by Sharda et al. (2011).

## **DISCUSSION**

Although geographic differences for the types and frequencies of canine cutaneous neoplastic and non neoplastic tumors are recognized, the reasons for these differences are not well understood. For some types of cutaneous tumors it is likely that, both climate and the breeds of dogs in respective locations play important roles. The ratios of various benign and malignant neoplastic conditions were in close proximity with those of Reddy et al. (2009). The majority of neoplastic



**Figure 6.** Venereal granuloma: Oval or round shaped neoplastic cells consisting of oval to spherical shaped vesicular nucleus and a prominent nucleolus (HE × 400).

conditions in Pomeranian breed in the present study might be due to the more population of this breed in the study area and the geographical distribution of various breeds. Higher incidences of skin and subcutaneous tumours have also been reported in several other breeds (Keefe, 1995; Wey et al., 1999; Singh et al., 2004).

The results of age wise occurrence corroborated well with those reported by Singh et al. (2004) and Pawar (2009). They also reported that, the incidence of tumours is higher in the dogs of age group 9 to 12 years. Dayananda et al. (2009) inferred that, the average age of incidence for malignant and benign tumours is 7.72 and 8.1 years, respectively. In the present study, only 4 cases were recorded in dogs less than 4 years of age. However, it might be because of decreased immunity, insufficient detoxifying and elimination process, hormonal imbalance and more exposure of carcinogenic agents which might have made the geriatric animals more susceptible for development of tumour (Gamlen et al., 2008). Similar finding was also reported by Kumar et al. (2002), who recorded 63.90% incidence of connective tissue tumour in males and 36.01% in females. As per Pawar (2009) the incidence of connective tissue tumour is reported to be 55.5% in males and 44.4% in females.

Rao and Rao (2009) also found that, the most frequently affected site for many types of tumours is cervix (23.08) followed by mammary gland (20.51%), ear (12.82%), abdomen (7.69%), tail (7.69%), claws (5.13%) and neck (5.13%). However, Sivakumar et al. (2004) reported that the preponderant tumour among canine is transmissible venereal tumour (59.61%) in dogs and 51.66% of the total tumour cases in all species which is very similar to the findings in the present study.

## Conclusion

Though, the exact cause of canine skin and subcutaneous tissue neoplasms is not known. However, it has been reported by Gamlen et al. (2008) that, excessive sun exposure to thin hair coat or light hair colour dogs predisposes them to suffer from certain cutaneous tumour.

This study serves to be pioneer finding for the particular geographical area of Chhattisgarh yet, one limitation of this study is that, it does not include samples from dogs which were not evaluated by a veterinarian, nor does it include samples from dogs seen by veterinarians who did not request histologic evaluation of skin masses. These limitations are likely a component of most studies of canine tumors. Nevertheless, the result of this study throws light on the prevailing tumour types in canine population of Durg district of Chhattisgarh which would be useful for further research.

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