

Retrospective Investigation of Canine Skin and Mammary Tumors in Korea

Yeong-Hun Kim, Na-Kyoung Ahn, In-Soon Roh*, Byung-IL Yoon and Jeong-Hee Han¹

School of Veterinary Medicine and Institution of Veterinary Science, Kangwon National University, Chuncheon 200-701, Korea

*National Veterinary Research and Quarantine Service, Anyang 430-824, Korea

(Accepted: September 30, 2009)

Abstract : Skin tumors and mammary gland tumors have been shown to be the most common neoplasia in most of the strains of dogs. The risk for tumor development increases significantly with age and the prevalence and distribution are various according to individual tumors. The aim of this study is to classify histopathologically the skin and mammary gland tumors for recent two years, 2005 and 2006. A total of 128 skin and 240 mammary gland samples of dogs were selected that were submitted to National Veterinary Research and Quarantine Service and Kangwon National University from January 1, 2005 to December 31, 2006. The excised tissue were fixed in 10 percent neutral buffered formalin and processed routinely to paraffin wax. Sections were cut at 3 μ m, stained with haematoxylin and eosin. The slides were examined based on the morphological criteria of M. H. Goldschmidt and W. Misdorp under a light microscope. The age of the dogs ranged from 1 to 19 years with a median of 8.7 years. The mean age of the skin and mammary gland tumors was 7.4 and 9.3 years. 47 (12.8%) were males and 259 (70.4%) were female with a male to female ratio of 0.18. Yorkshire terrier and maltese were more susceptible breeds, accounting for 44.3% of skin and mammary gland tumors. In skin tumors, epithelial, adnexal, and mesenchymal origin tumors were 18 (14.1%), 53 (41.4%), and 57 cases (44.5%), respectively. Among the epithelial, adnexal, and mesenchymal origin tumors, basal cell tumor (8.6%), sebaceous adenoma (15.6%), and histiocytoma (25.0%) were predominant in the incidence rate, respectively. In case of mammary gland tumors, 201 (83.8%) were benign and 39 (16.3%) were malignant with a benign to malignant ratio of 5.15. The most frequent mammary gland tumor was benign mixed tumor (35.0%) followed by mammary adenoma-complex type (31.7%).

Key words : canine, dog, Korea, mammary tumor, skin tumor.

Introduction

The risk for tumor development in companion animals increases significantly with age (4,7). According to previous studies, skin and mammary gland tumors have been shown to be the most common neoplasia in most of the breeds of dogs, which is considered to be due to the high opportunity of a variety of radiological, chemical and physical insults, age- or pregnancy-associated hormonal imbalances, and parasitic or viral infection (5). The incidence rate of skin and mammary gland tumors has been considerably variable depending on the geographical location, prevalent environmental influences and breed population (3,6). Thus, prevalence and classification of skin and mammary tumors would be valuable as a background data profile for veterinary sciences, particularly in clinical diagnosis and therapeutic treatments.

Tumors are usually classified according to the cellular origin and malignancy. In skin, various epithelial and mesenchymal cell tumors have been reported and well described in the lit-

erature; epidermal tumors (including basal cell tumor and squamous cell carcinoma) and adnexal tumors (including tricholemmoma, trichoblastoma, pilomatricoma, sebaceous adenoma, perianal gland adenoma, and apocrine adenoma), and mesenchymal tumors (including histiocytoma, lipoma, mast cell tumor and fibroma) have been reported in dogs with different frequency (9,10,19).

Mammary gland tumor is also one of the most common tumors in dogs; malignant tumors include complex carcinoma, simple carcinoma exemplified by tubulopapillary carcinoma, solid carcinoma and anaplastic carcinoma, special types of carcinoma such as spindle cell carcinoma, squamous cell carcinoma, mucinous carcinoma and lipid-rich carcinoma, sarcomas and carcinosarcoma and, benign tumors include adenoma, fibroadenoma, benign mixed tumor and duct papilloma (13, 14,15).

Since information on prevalence and distribution of individual skin and mammary gland tumors helps the veterinary practitioners to diagnose them in time, determine an appropriate therapy and anticipate an adequate prognosis, we classified histopathologically the skin and mammary gland tumors according to age, sex, localization, and breed for recent two years in Korea.

Y.H. Kim and N.K. Ahn contributed equally for this study.

¹Corresponding author.

E-mail : hanjh@kangwon.ac.kr

Materials and Methods

Study subjects examined

For the study, a total of 128 skin and 240 mammary gland samples were respectively selected that had been submitted to National Veterinary Research and Quarantine Service and Kangwon National University from January 1, 2005 to December 31, 2006. The examined samples consisted of 47 male and 259 female cases and the age range of the dogs was from 1 year to 19 years. Dividing the cases based on age, < 5 years old, 6 to 10 years old, 11 to 15 years old, and above 16 years were 51, 39, 34, and 2 cases for skin tumors and 29, 129, 73 and 5 cases for mammary tumors, respectively (Table 1).

Yorkshire terrier (30 skin tumors and 54 mammary tumors), Maltese (13 skin tumors and 65 mammary tumors), Shih-tzu (26 skin tumors and 24 mammary tumors), Poodle (9 skin tumors and 40 mammary tumors), Cocker spaniel (7 skin tumors and mammary tumors), Schanuzer (9 skin tumors and 3 mammary tumors), Mixed (20 skin tumors and 27 mammary tumors) and other strains (14 skin tumors and 20 mammary tumors) were applied for the study. In the tumors examined, 44 and 56 cases of skin tumors and 3 and 203 cases of mammary tumors were respectively from male and female dogs and other 28 and 34 cases of skin and mammary tumors were unknown in gender.

Histopathological examination

The tumor tissues were fixed in 10% neutral buffered formalin. After the routine tissue processes for paraffin embedded tissue block, the sections, 3 µm in thickness, were prepared for haematoxylin and eosin stain.

Classification : histology, breed, age, sex and site-based

The skin and mammary tumors were respectively classified according to the histomorphological criteria of Goldschmidt *et al.* (1998) (9) and Misdorp *et al.* (1999) (14) under a light microscope. The skin tumors included epidermal and adnexal epithelial tumors and mesenchymal tumors located in the skin. The prevalent sites of the tumors were also investigated depending on the different types of skin and mammary tumors

Table 2. Incidence of the canine skin tumors presented from January of 2005 to December of 2006

Neoplasm (N= 128)	Frequency
Epithelial tumors	18/128 (14.1%)
Basal cell tumor	11/128 (8.6%)
Squamous cell carcinoma	3/128 (2.3%)
Papilloma	3/128 (2.3%)
Inverted papilloma	1/128 (0.8%)
Adnexal tumors	53/128 (41.4%)
Sebaceous adenoma	20/128 (15.6%)
Perianal gland adenoma	8/128 (6.3%)
Pilomatricoma	6/128 (4.7%)
Trichoblastoma	5/128 (3.9%)
Others	14/128 (10.9%)
Mesenchymal tumors	57/128 (44.5%)
Histiocytoma	32/128 (25.0%)
Lipoma	8/128 (6.3%)
Mast cell tumor	5/128 (3.9%)
Fibroma	7/128 (5.5%)
Others	5/128 (3.9%)

from each strain. The skin and mammary tumor incidence between genders was further compared depending on breed, age and site.

Results

For skin tumors, 128 cases presented across Korea were examined. Epidermal, adnexal and mesenchymal tumors accounted for 18 cases (14.1%), 53 cases (41.4%) and 57 cases (44.5%), respectively. Among all of the skin tumors, cutaneous histiocytoma was found the most frequent as 32 cases (25.0%), followed by sebaceous gland adenoma (20 cases, 15.6%), basal cell tumor (11 cases, 8.6%), perianal gland adenoma and lipoma (8 cases for each, 6.3%), fibroma (7 cases, 5.0%), pilomatricoma (6 cases, 4.7%), mast cell tumor and trichoblastoma (5 cases for each, 3.9%) and squamous cell carcinoma and papilloma (3 cases for each, 2.3%) (Table 2).

Table 1. Age and sex-based distribution of canine skin and mammary gland tumors examined

Age (yrs)	Skin tumor (N= 128)						Mammary gland tumor (N= 240)					
	< 5	6~10	11~15	> 16	Unknown	Total	< 5	6~10	11~15	> 16	Unknown	Total
Male	20*	12	11	1	0	44	1	1	1	0	0	3
	(5.4)	(3.3)	(3.0)	(0.3)	(0.0)	(12.0)	(0.3)	(0.3)	(0.3)	(0.0)	(0.0)	(0.8)
Female	19	19	18	0	0	56	25	115	56	3	4	203
	(5.2)	(5.2)	(4.9)	(0.0)	(0.0)	(15.2)	(6.8)	(31.3)	(15.2)	(0.8)	(1.1)	(55.2)
Unknown	12	8	5	1	2	28	3	13	16	2	0	34
	(3.3)	(2.2)	(1.4)	(0.3)	(0.5)	(7.6)	(0.8)	(3.5)	(4.3)	(0.5)	(0.0)	(9.2)
Total	51	39	34	2	2	128	29	129	73	5	4	240
	(13.9)	(10.6)	(9.2)	(0.5)	(0.5)	(34.8)	(7.9)	(35.1)	(19.8)	(1.4)	(1.1)	(65.2)

*, Number of tumors (%)

Table 3. Incidence of skin tumors in the different canine breeds examined

Neoplasm (N = 128)	Maltese N = 13	Shitzu N = 26	Yorkshire terrier N = 30	Mixed N = 20	Others N = 39
Epithelial tumors					
Basal cell tumor	3 (23.1%)	1 (3.8%)	4 (13.3%)	0 (0.0%)	3 (8.1%)
Squamous cell carcinoma	0 (0.0%)	1 (3.8%)	1 (3.3%)	0 (0.0%)	1 (2.6%)
Papilloma	0 (0.0%)	1 (3.8%)	1 (3.3%)	1 (5.0%)	0 (0.0%)
Inverted papilloma	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.7%)
Adnexal tumors					
Sebaceous adenoma	2 (15.4%)	8 (30.8%)	1 (3.3%)	3 (15.0%)	6 (16.2%)
Perianal gland adenoma	0 (0.0%)	3 (11.5%)	0 (0.0%)	1 (5.0%)	4 (10.8%)
Pilomatricoma	0 (0.0%)	0 (0.0%)	2 (6.7%)	2 (10.0%)	2 (5.4%)
Trichoblastoma	2 (15.4%)	0 (0.0%)	2 (6.7%)	0 (0.0%)	1 (2.7%)
Others	2 (15.4%)	0 (0.0%)	6 (20%)	4 (20%)	2 (2.7%)
Mesenchymal tumors					
Histiocytoma	3 (23.1%)	7 (26.9%)	7 (23.3%)	5 (25.0%)	10 (27.0%)
Lipoma	0 (0.0%)	2 (7.7%)	2 (6.7%)	0 (0.0%)	4 (10.8%)
Mast cell tumor	0 (0.0%)	0 (0.0%)	2 (6.7%)	1 (5.0%)	2 (5.4%)
Fibroma	0 (0.0%)	1 (3.8%)	1 (3.3%)	2 (10.0%)	3 (8.1%)
Others	1 (7.7%)	2 (7.7%)	1 (3.3%)	1 (5.0%)	0 (0.0%)

Table 4. Analysis of the locations of skin tumors

Neoplasm (N = 128)	Head & Neck (32)	Trunk (28)	Extremities (14)	Unknown (54)
Epithelial tumors				
Basal cell tumor (N = 11)	5 (15.6%)	1 (3.6%)	0 (0.0%)	5 (9.3%)
Squamous cell carcinoma (N = 3)	0 (0.0%)	2 (7.1%)	0 (0.0%)	1 (1.9%)
Papilloma (N = 3)	0 (0.0%)	1 (3.6%)	0 (0.0%)	2 (3.7%)
Inverted papilloma (N = 1)	0 (0.0%)	1 (3.6%)	0 (0.0%)	0 (0.0%)
Adnexal tumors				
Sebaceous adenoma (N = 20)	5 (15.6%)	2 (7.1%)	0 (0.0%)	13 (24.1%)
Perianal gland adenoma (N = 8)	0 (0.0%)	0 (0.0%)	8 (57.1%)	0 (0.0%)
Pilomatricoma (N = 6)	0 (0.0%)	3 (10.7%)	1 (7.1%)	2 (3.7%)
Trichoblastoma (N = 5)	0 (0.0%)	1 (3.6%)	0 (0.0%)	4 (7.4%)
Others (N = 14)	3 (9.3%)	3 (10.7%)	0 (0.0%)	8 (14.7%)
Mesenchymal tumors				
Histiocytoma (N = 32)	16 (50.0%)	5 (17.9%)	2 (14.3%)	9 (16.7%)
Lipoma (N = 8)	0 (0.0%)	5 (17.9%)	0 (0.0%)	3 (5.6%)
Mast cell tumor (N = 5)	1 (3.1%)	2 (7.1%)	1 (7.1%)	1 (1.9%)
Fibroma (N = 7)	2 (6.3%)	0 (0.0%)	2 (14.3%)	3 (5.6%)
Others (N = 5)	0 (0.0%)	2 (7.1%)	0 (0.0%)	3 (5.6%)

Epidermal tumors included basal cell tumor, squamous cell carcinoma, papilloma and inverted papilloma. Basal tumor accounted for 8.6% of a total of skin tumors and 61.1% of the epidermal tumors (11 cases out of 18) (Table 2). Male was much higher than female in tumor incidence; it was 2.5 fold. The mean age of the dogs with the tumor was 7.4 years old. Head was the most common site for this tumor; 45.5% of this tumor was found in the site (Table 4). Yorkshire terrier was the relatively frequent breed for this tumor, accounting for

36.4% of total basal cell tumor number (Table 3). Both squamous cell carcinoma and papilloma were found in the 3 cases (2.3%) out of 18 epidermal tumors; the mean age of the dogs with these tumors was 12.5 and 6.0 years, respectively (Table 2).

For adnexal tumors, sebaceous gland adenoma was the most frequent among the adnexal tumors as 37.7% (Table 2). The mean age of the dogs with this tumor was 10.3 years and female dogs were higher than male in tumor incidence (1.83 : 1.0). Head was the most common site of this tumor; 20.0%

Table 5. Prevalence of the mammary gland tumors examined

Neoplasm (N = 240)	Frequency (%)
Benign tumors	201 (83.8%)
Mixed tumor	84 (35.0%)
Adenoma-complex	76 (31.7%)
Adenoma-simple	38 (15.8%)
Fibroadenoma	2 (0.8%)
Duct papilloma	1 (0.4%)
Malignant tumors	39 (16.3%)
Carcinoma-simple	16 (6.7%)
Carcinoma-complex	16 (6.7%)
Carcinosarcoma	6 (2.5%)
Mucinous carcinoma	1 (0.4%)

of the tumors were found in the site (Table 4). This tumor was relatively frequent in the Shihtzu dogs, as 40.0% of the tumor was found in the breed (Table 3). In particular, sebaceous gland adenoma was found distinguishably high in female of this breed. Perianal gland tumor was found in 8 cases (6.3% in skin tumors), accounting for 15.1% of total number of adnexal skin tumors (Table 2). This tumor was generally developed in the relatively old male dogs; its incidence in male was 2.5 fold of female and the mean age was 10.0 years. Poodle and Shihtzu breeds were relatively frequent in the tumor development (Not given). Pilomatocoma was found in a few cases in the dogs examined (Table 2). The incidence of the tumor appeared higher in female, but there was difficult to determine gender predilection in the present study because of the limited number of subjects. Half of the tumors were found on the trunk (Table 4). Trichoblastoma indicated low incidence, accounting for 3.9% of skin tumors and 9.4% of the total adnexal tumors (Table 2). Meibomian adenoma and adenocarcinoma in ear were found in one case for each (Not given).

The mesenchymal cell tumors were the most frequent in the tumors located in the skin including epidermal and ad-

exal tumors (Table 2). Among the mesenchymal cell-originated tumors, cutaneous histiocytoma was found frequently developed in the relatively young dogs; the mean age of the dogs with this tumor was 3.5 years of age in this study. Despite of the limited number of breeds examined, Yorkshire terrier and Shihtzu were the most prevalent in cutaneous histiocytoma development, respectively accounting for 23.3% and 26.9% in the skin tumors (Table 3). Cutaneous histiocytoma was the most frequent tumor among the skin tumors of mixed breed, occupying 25.0% in the skin tumor (Table 3). There was no gender predilection in the cutaneous histiocytoma. Lipoma was found in 8 cases (6.3%) out of a total 128 skin tumor cases, recording second high in frequency in the skin mesenchymal tumors (Table 3). Despite of limited interpretation because of small number of cases, this tumor appeared to be more frequent in female than male (2 : 1). Fibroma and mast cell tumor were found in 5.5% and 3.9% of a total of skin tumors (6/128 cases), respectively, each accounting for 10.6% of the skin mesenchymal cell tumors (Table 3). There was no preposition in the case of mast cell tumor, but head and trunk were the predominant sites for fibroma. Fibrosarcoma, hemangiosarcoma, hemagiopericytoma, and poorly differentiated spindle cell sarcoma were found in only one case for each tumor (Table 3).

For mammary tumors, 240 cases were presented in the present study and classified based on the histological criteria of Misdorp *et al.* (1999) (14). Histologically, 201 cases of benign tumors and 39 cases of malignant tumors were respectively diagnosed (Table 5). Prevalence of mammary gland tumors was similar in all the breeds examined in the present study. Within the all types of mammary tumors, an order of high frequency was found: benign mixed tumor, adenoma-complex type, adenoma-simple type and carcinoma. Among the benign tumors, mixed tumor was predominant in most of the breeds as it was found in 84 cases out of total cases (35.0% of total mammary tumor cases and 41.7% of benign tumors) (Table 5). The mean age was 8.5 years. As other benign tumors, adenoma including complex and simple type, duct pap-

Table 6. Incidence of mammary tumors in the different canine breeds examined

Neoplasm (N = 128)	Maltese N = 65	Shitzu N = 24	Yokshire terrier N = 54	Poodle N = 40	Others N = 57
Benign tumors					
Mixed tumor	19 (29.2%)	9 (37.5%)	26 (48.1%)	13 (32.5%)	17 (29.8%)
Adenoma-complex	24 (36.9%)	7 (29.2%)	12 (22.2%)	14 (35.0%)	19 (33.3%)
Adenoma-simple	11 (16.9%)	7 (29.2%)	8 (14.8%)	6 (15.0%)	6 (10.5%)
Fibroadenoma	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (3.5%)
Duct papilloma	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.5%)	0 (0.0%)
Malignant tumors					
Carcinoma-simple	2 (3.1%)	1 (4.2%)	5 (9.3%)	4 (10.0%)	4 (7.0%)
Carcinoma-complex	5 (7.7%)	0 (0.0%)	3 (5.6%)	0 (0.0%)	8 (14.0%)
Carcinosarcoma	4 (6.2%)	0 (0.0%)	0 (0.0%)	2 (5.0%)	0 (0.0%)
Mucinous carcinoma	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.8%)

illoma, and fibroadenoma respectively accounted for 31.6% (76 cases), 13.8% (38 cases), 0.4% (1 case), and 0.8% (2 cases) of mammary tumors (Table 5). In Maltese and Poodle breeds, adenoma, in particular complex type, was more common than benign mixed tumor (Table 6). In malignant mammary tumors, carcinomas of simple and complex type were evident in 16 cases out of 39 malignant tumors for each, accounting for 6.7% of total number of mammary gland tumors and 41.0% of malignant. Carcinosarcoma and mucinous carcinoma were respectively diagnosed in 6 cases and 1 case, accounting for 2.5% and 0.4% of total mammary gland tumors and 15.4% and 2.7% of malignant tumors, respectively (Table 5). Malignant mammary tumors appeared to be developed in more aged dogs than benign tumors; the mean age was 11.5 years and 8.8 years, respectively.

Discussion

In the present study, prevalence of skin and mammary tumors was investigated in various canine breeds presented to National Veterinary Research and Quarantine Service and Kangwon National University from January 1, 2005 to December 31, 2006. The circumstances we live are very much changeable because of so many factors including environmental pollutants, hormones and hormone-disrupting chemicals, changes in food culture, longer life span and well-being condition. Thus, it could be considerably worthy to investigate prevalence of disease incidence from time to time.

Skin is the most common site easily exposed to such changeable circumstances inducible various tumors. Indeed, skin and mammary gland tumors are the most frequent neoplasia in dogs (17). According to previous studies, the common cutaneous tumors included mast cell tumor, cutaneous histiocytoma, lipoma, basal cell tumor and sebaceous gland adenoma, although some difference in the order of frequency (1,2,8,12,18,20,23). In a good agreement, these tumors occupied the tumor groups with high frequency also in the present study. The most common sites of skin tumors were found head and neck, which was consistent with the previous studies (18).

Cutaneous histiocytoma was the most frequent skin tumor in this study. This tumor has been reported to be relatively common in young age dogs, particularly in Boxer and Dachs-hund breed (22). The frequency of the tumor in this study was, compared with that of other cutaneous tumors, higher than expected, which may be due to relatively high proportion of young dogs less than 5 years of age. The mean age of the dogs with cutaneous histiocytoma was 3.5 years of age in this study. The high frequency of this tumor in the young dogs was in accordance with the previous studies (22). Cutaneous histiocytoma have been shown to be the majority occurring in dogs less than 4 years of age (10). Although not addressed in the present study, the tumors are known to be grossly observed as small masses, usually less than 2 cm in diameter, and the growths are usually domed or buttonlike in shape (19). High mitotic figures and rapid growth are charac-

teristics of this tumor, but cutaneous histiocytoma in dogs is usually considered as benign with good prognosis. Many cases of the tumors spontaneously regress (19). According to our results, this tumor was found relatively high in the Yorkshire terrier and Shih-tzu breed, which might be associated with the large number of these breeds presented in this study.

Sebaceous gland tumor was evaluated as the most common epithelial skin tumor in the dog, accounting for approximately one-third of the total in one series (16). In the present study, in a good agreement with the previous study, sebaceous gland adenoma was the most frequent epithelial tumor in the dogs examined. Female dogs appeared to be much more common in this tumor (2 : 1), which was also similar to the previous study (21).

Basal cell tumor followed the sebaceous gland adenoma in the frequency in the skin tumors examined in this study. This tumor was the most common in the epidermal cell skin tumors in this study, which has been usually found in the previous studies (1,2,8,12,18,20,23). Basal cell tumors are usually considered to be benign in almost all respects (19). As described in the literature (19), this tumor was found more common in male dog than female in this study.

Lipoma appeared to be relatively common in the dogs without breed and gender predilection. Pakhrin *et al.* (2007) (18) reported this tumor as the first ranked cutaneous tumor in Korea, except for non-tumorigenic epidermal and follicular cysts. In our study, lipoma was not so much high as 6.3% of a total of skin tumors examined, it ranked the fourth among the total skin tumors and the second among the mesenchymal cell tumors of skin. Such high incidence of lipoma may be associated with high-nutrition diet inducing overweight, supported by our and other study (19) in which lipoma was shown to be more common in overweight female dogs than in male. However, gender predilection of lipoma was not evident in the present study.

Mammary tumors, as clearly documented in the literature, were common in female dogs; all cases examined in the present study were from female dogs. In dogs, mammary tumors are very much variable in structure and biological behavior. Classification based on descriptive morphology has been widely used than histogenetic classification because of the uncertainty of specific cell types of origin of many mammary tumors (14). Thus, our study also followed the descriptive morphology-based classification. This classification method was the basis of WHO classification (14).

According to the previous studies, mammary tumors reach the highest frequency during the 6 to 10 years of age in dogs; about 53.8% had been shown to develop during the ages (1,17). Accordingly, the mean age of the dogs with mammary tumors was 9.3 years of age in this study. Benign mammary tumors appeared to be developed earlier than malignant tumors in this study. This finding was also in accordance with the previous studies (1,17).

Benign mixed tumor, characterized by the complexity of cellular units that include epithelium, myoepithelium, hya-

line cartilage, and osteoid bone (13,14,15), was the most frequent tumor type in the mammary tumors of most of the canine breeds in this study. The result was consistent with the previous studies (13,15,16). Complex adenoma was also a relatively common mammary tumor type in most of the breeds, followed by simple adenoma. It was even more common than benign mixed tumor in the Maltese and Poodle breeds. In malignant mammary tumors, complex and simple carcinomas were relatively commonly found in the dogs. Simple carcinoma has been considered to be worse in prognosis than complex carcinoma (11,13), but the prognosis is more dependent on the malignant features such as degree of infiltration and histologic grade of malignancy and other factors such as age and tumor size (11).

For reasonable and appropriate therapies of tumors, proper diagnosis is prerequisite. Tumor diagnosis including prognosis can be achieved on the basis of integrated information such as clinical history, tumor growth patterns, gross appearances, histological features, and other factors such as breed, sex, age and site. In the present study, prevalence of skin and mammary tumors was investigated in various canine breeds presented from January 1, 2005 to December 31, 2006. Our results will be helpful for clinical practitioners to properly approach to diagnosis and therapy of skin and mammary tumors which are commonly developed in various breeds of dog.

Acknowledgement

This work was supported by the Grant from Yang Young Foundation

References

1. Bostock DE. Neoplasms of the skin and subcutaneous tissues in dogs and cats. *Br Vet J* 1986; 143: 1-19.
2. Brodey RS. Canine and feline neoplasia. *Adv Vet Sci Comp Med* 1970; 14: 309-354.
3. Cohen D, Erif JS, Brodey RS, Keiser H. Epidemiological analysis of the most prevalent sites and types of canine neoplasia observed in a veterinary hospital. *Cancer Res* 1974; 34: 2859-2868.
4. Dil'man VM. Age associated factor in the risk of tumor development. *Vopr Onkol* 1973; 19: 101-111.
5. Dobson JM, Samuel S, Milstein H, Rogers K, Wood JL. Canine neoplasia in the UK: estimates of incidence rates from a population of insured dogs. *J Small Anim Pract* 2002; 43: 240-246.
6. Dorn CR. The epidemiology of cancer in animals. *Calif Med* 1967; 107: 481-489.
7. Dorn CR, Taylor DON, Chaulk BS, Hibbard HH. The prevalence of spontaneous neoplasms in a defined canine population. *Am J Public Health Nations Health* 1966; 56: 245-265.
8. Finnie JW, Bostock DE. Skin neoplasia in dogs. *Aust Vet J* 1979; 55: 602-604.
9. Goldschmidt MH, Dunstan RW, Stannard AA, Von Tscherner C, Walder EJ, Yager JA. Histopathological classification of epithelial and melanocytic tumors of the skin of domestic animals. 2nd series, vol. III. Washington DC: The Armed Forces Institute of Pathology, 1998: 15-105.
10. Goldschmidt MH, Hendrick MJ. Tumors of the skin and soft tissues. In: *Tumors in Domestic Animals*, 4th ed. Ames, Iowa: Iowa State University Press. 2002: 45-118.
11. Jabara AG. Canine mixed tumours. *Aust Vet J* 1960; 36: 212-221.
12. Kaldrymidou H, Leontides L, Koutinas AF, Saridomichelakis MN, Karayannopoulou M. Prevalence, distribution and factors associated with the presence and the potential for malignancy of cutaneous neoplasms in 174 dogs admitted to a clinic in northern Greece. *J Vet Med A Physiol Pathol Clin Med* 2002; 49: 87-91.
13. Misdorp W. Tumors of the mammary gland. In: *Tumors in Domestic Animals*, 4th ed. Ames, Iowa: Iowa State University Press. 2002: 575-606.
14. Misdorp W, Else RW, Hellmen E, Lipscomb TP. Histological classification of mammary tumors of the dog and the cat. 2nd series, vol. VII. Washington DC: The Armed Forces Institute of Pathology, 1999: 3-58.
15. Moulton JE. Tumors of the mammary gland. In: *Tumors in Domestic Animals*, 3rd ed. London: University of California Press, Ltd. 1990: 518-552.
16. Nielsen SW, Cole CR. (1960) Cutaneous epithelial neoplasms of the dog-A report of 153 cases. *Am J Vet Res* 1960; 21: 931-948.
17. Nitchell L, de la Iglesia FA, Wenkoff MS, Van Dreuvel AA, Lumb G. Mammary tumors in dogs: survey of clinical and pathological characteristics. *Can Vet J* 1974; 15: 131-138.
18. Pakhrin B, Kang MS, Bae IH, Park MS, Jee H, You MH, Kim JH, Yoon BI, Choi YK, Kim DY. Retrospective study of canine cutaneous tumors in Korea. *J Vet Sci* 2007; 8: 229-236.
19. Pulley LT, Stannard AA. Tumors of the skin and soft tissues. In: *Tumors in Domestic Animals*, 3rd ed. Berkeley: University of California Press. 1990: 23-87.
20. Rothwell TL, Howlett CR, Middleton DJ, Griffiths DA, Duff BC. Skin neoplasms of dogs in Sydney. *Aust Vet J* 1987; 64: 161-164.
21. Straffuss AC. Sebaceous gland adenomas in dogs. *J Amer Vet Med Assoc* 1976; 169: 640-642.
22. Taylor DON, Dorn CR, Luis OH. Morphologic and biologic characteristics of the canine cutaneous histiocytoma. *Cancer Res* 1969; 29: 83-92.
23. Vail DM, Withrow SJ. Tumors of the skin and subcutaneous tissues. In: *Small Animal Clinical Oncology*, 2nd ed. Philadelphia: WB Saunders Co. 1996: 167-191.

한국에서 개 유선종양과 피부종양의 발생현황

김영훈 · 안나경 · 노인순* · 윤병일 · 한정희¹

강원대학교, *국립수의과학검역원

요 약 : 피부와 유선 종양은 개에서 매우 빈번히 발생하는 종양으로, 종양 발생의 위험은 나이가 증가함에 따라 종양의 발생률은 증가하며, 발병률과 발병부위의 분포는 종양의 종류마다 다르다. 피부와 유선종양의 발생은 공기오염, 생활 등 환경의 변화와도 관련이 있어 이들 종양들의 발생양상은 그 사회의 환경을 반영할 수 있어 시대와 지역에 따라 다양하게 다르게 나타날 수 있다. 따라서, 그 동안의 많은 보고들에도 불구하고, 피부와 유선종양발생에 대한 자료들은 종양에 대한 수의임상학적 진단과 치료를 위한 중요한 정보를 제공한다. 본 연구에서는 2005년 1월 1일부터 2006년 12월 31일까지 수의과학검역원과 강원대학교에 의뢰된 128증례의 개 피부종양과 240증례의 개 유선종양을 Goldschmidt와 Misdorp의 형태학적 기준에 의해 조직병리학적으로 진단하여, 종별, 성별 및 부위별로 각각 분류하여 국내에서 이들 종양의 발생양상을 체계적으로 분석하였다. 피부종양에서는 피부상피세포종양, 샘종양 및 간질종양이 각각 14.1%, 41.4%와 44.5%였다. Cutaneous histiocytoma가 피부종양에서 가장 빈번하게 관찰되어 전체 피부종양의 25.0%를 차지하였으며, 기름샘종 (sebaceous gland adenoma; 15.6%), 기저세포종(basal cell tumor; 8.6%), 항문돌레샘종 (perianal gland adenoma; 6.3%)와 지방종 (lipoma; 6.3%)순으로 높았다. 그 외에 비만세포종, 모낭세포종과 중층편평상피암 등이 관찰되었다. 이러한 피부종양들은 품종, 성과 나이 또는 부위에 따라 유사하거나 다른 양상을 나타내었다. 유선종양의 경우 양성과 악성이 201/240, 39/240으로 양성발생률이 현저히 높았으며, 양성혼합종 (benign mixed tumor)이 검사한 품종 모두에서 가장 높은 발생률 (35.0%)을 나타내었다. Complex adenoma는 Maltese와 Poodle에서 특히 높았으며, 악성종양에서는 simple carcinoma와 complex carcinoma가 각각 6.7%로, 악성 중 41.0%를 차지하여 가장 높은 발생률을 나타내었다. 본 연구결과는 최근 우리나라에서 여러 품종의 반려견에서 발생한 피부와 유선종양의 발생양상을 조직병리학적으로 진단 분석한 것으로, 임상수의사들이 지속적으로 증가추세에 있는 개의 피부와 유선종양을 진단하고 치료하는데 유용하게 활용될 수 있기를 기대한다.

주요어 : 개, 한국, 피부종양, 유선종양.