

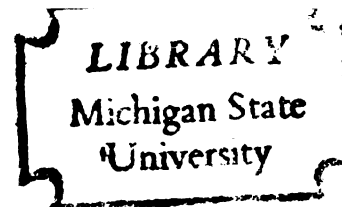


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A SURVEY OF EYELID NEOPLASMS
OF DOGS

Thesis for the Degree of M. S.
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1968

THESIS



ABSTRACT

A SURVEY OF EYELID NEOPLASMS OF DOGS

by Janver D. Krehbiel

The purpose of this study was to histologically classify canine eyelid neoplasms submitted to the Department of Pathology, Michigan State University, during a period of 12 years and to observe the gross appearance of eyelid tumors in dogs admitted to the Michigan State University Veterinary Clinic for 1 year.

The 107 neoplasms examined were classified histogenically into 3 major tumor types and a group of miscellaneous neoplasms. The incidence of occurrence of these major types was: sebaceous gland neoplasms, 43.9% (47); melanomas, 23.4% (25); papillomas, 20.6% (22); and miscellaneous neoplasms, 12.1% (13).

Seventy per cent of the neoplasms were benign and 30% were malignant. Forty-five neoplasms were removed from upper eyelids and 33 were removed from lower eyelids. Malignant melanomas and sebaceous adenocarcinomas occurred on upper eyelids more frequently than on lower eyelids.

Of the 35 breeds represented in this study, Cocker Spaniels had the highest incidence of eyelid neoplasms.

The gross appearance of eyelid neoplasms revealed a general trend toward pedunculation or encapsulation of benign tumors while malignant neoplasms were invasive and diffusely attached. Hyperpigmentation of eyelid neoplasms was frequently noted.

A SURVEY OF EYELID NEOPLASMS OF DOGS

By

Janver D. Krehbiel

A THESIS

Submitted to
Michigan State University
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TABLE OF CONTENTS

	Page
INTRODUCTION.	1
REVIEW OF LITERATURE.	2
A. Anatomy of the Eyelid.	2
B. Eyelid Neoplasms of the Dog.	3
C. Neoplasms of the Cutaneous System.	5
D. Clinical Significance of Eyelid Tumors	6
E. Eyelid Tumors in Man	8
MATERIALS AND METHODS	9
RESULTS	11
A. Squamous Papillomas.	15
B. Sebaceous Gland Tumors	15
1. Sebaceous Adenomas.	15
2. Pigmented Sebaceous Adenomas.	18
3. Sebaceous Adenocarcinomas	18
C. Melanomas.	18
D. Miscellaneous.	23
DISCUSSION.	25
SUMMARY	28
LIST OF REFERENCES.	29
VITA.	31

LIST OF TABLES

Table		Page
1	Incidence of eyelid neoplasms in numbers and per cent. . .	14
2	Incidence of miscellaneous neoplasms in numbers.	24

LIST OF FIGURES

Figure		Page
1	Two neoplasms (sebaceous adenoma and melanoma) on the left lower eyelid.	13
2	Relative incidence of major eyelid neoplasms of the dog.	13
3	Squamous papilloma on left upper eyelid.	16
4	Photomicrograph of the squamous papilloma in Figure 3. . .	16
5	Sebaceous adenoma on the conjunctival surface of the left lower eyelid.	17
6	Photomicrograph of the sebaceous adenoma in Figure 5 . . .	17
7	Photomicrograph of a pigmented sebaceous adenoma	19
8	Sebaceous adenocarcinoma on the edge of the right lower eyelid	20
9	Photomicrograph of a sebaceous adenocarcinoma.	20
10	Benign melanoma on the dermal edge of the right upper eyelid	21
11	Photomicrograph of a benign melanoma	21
12	Malignant melanoma on the conjunctival surface of the left upper eyelid.	22
13	Photomicrograph of a malignant melanoma.	22

INTRODUCTION

The classification of neoplasms of canine eyelids has received little attention. A survey of eyelid tumors in the dog was made because of the relatively common occurrence of neoplastic lesions in these structures, and because of the differing opinions as to which type was most frequently observed.

The objectives of this study were to (1) record the gross appearance of eyelid tumors in the dog, (2) histologically classify tumors collected over a 12-year period, and (3) identify trends of incidence relative to breed, sex, age and location.

REVIEW OF LITERATURE

There are very few publications regarding neoplasms specifically associated with the eyelid of the dog. Since the skin covering of the eyelid is continuous with the skin covering the remainder of the body, it was deemed appropriate to include references on skin neoplasms.

A. Anatomy of the Eyelid

Miller (1965) described the eyelids as dermal structures covered on the external surface by normal hair-bearing skin and on the inner surface by a thin mucous membrane, the conjunctiva. Between these 2 epithelial layers he identified the following tissues: muscle fibers, lymphatic nodules, vascular channels, nerve fibers, fat and connective tissue. Eyelashes were described as originating from hair follicles near the mucocutaneous edge of the lid.

Prince et al. (1960) described 3 glandular elements in the canine eyelid. The largest were the meibomian glands, located on the inner surface of the eyelid, immediately under the conjunctiva. Moll's glands were much smaller and were usually located near the lash follicle in association with the equally minute Zeis glands. The glands of Moll were considered to be modified sweat glands while the meibomian and Zeis glands were sebaceous glands. Eyelashes predominated among the lateral margin of the upper eyelid, but were almost absent in the lower eyelid. Prince pointed out that in dogs the lower eyelid was smaller than the upper, and comparatively it was not as well developed.

There are numerous references detailing the exact histological structure of the canine eyelid, which were not included in this review. However, an anatomical description was included to identify the many different tissues in the eyelid, which may undergo neoplasia.

B. Eyelid Neoplasms of the Dog

One of the early reports of eyelid neoplasia was made by McFadyean (1890), in a report of a tumor "about the size of a walnut" which was removed from the lower eyelid of a dog. Histologically the tumor was classified as a spindle-cell sarcoma.

Mulligan (1944) published a survey of canine tumors collected at the Polyclinic of the Faculty of Veterinary Medicine of the University of Berlin. Several types of skin neoplasms were observed, including carcinoma, fibroma and papilloma. These tumors were located on various parts of the body, including the eyelid. It was noted that 70% of the skin tumors occurred in dogs over 6 years of age.

Smythe (1958) reported squamous cell carcinoma, papilloma, angioma, sarcoma and basal cell carcinoma as types of neoplasms known to have affected eyelids in domestic animals. He also stated that chalazion and hordeolum are inflammatory conditions that may resemble neoplasms of the eyelid.

In a report of data compiled from selected veterinary diagnostic laboratories in the United States and Canada, Poppensiek (1961) classified types of neoplasms, anatomical locations and species affected. The School of Veterinary Medicine, University of Pennsylvania, reported 27 neoplasms removed from canine eyelids between 1952 and 1960. These neoplasms were classified as follows: sebaceous gland neoplasms 21, papillomas 3, histiocytoma 1, squamous cell carcinoma 1 and mastocytoma 1.

In the same study, New York State Veterinary College, Cornell University, reported 11 carcinomas removed from canine eyelids between 1950 and 1960.

Jubb and Kennedy (1963) stated that neoplastic lesions associated with skin generally may also occur in the skin of the eyelids. They indicated that basal cell tumors, particularly those of sebaceous differentiation, are most common.

Moulton (1961) indicated that there was a high incidence of skin tumors in dogs. Among the neoplasms commonly found in the skin of the eyelid were papillomas, melanomas and sebaceous gland tumors. Basal cell tumors and sweat gland adenomas were noted frequently in the skin of the face, although no reference was made to their occurrence on the eyelid.

Mulligan (1949) discussed epithelial neoplasms of the skin and mentioned the eyelid as a common site for squamous papillomas, basal cell carcinomas and sebaceous gland neoplasms. Neoplasms of mesenchymal origin appeared less frequently in association with the eyelid. However, fibromas were mentioned as occurring occasionally in the eyelid, and it was suggested that Boston Terriers and Fox Terriers tended to have fibromas more frequently than other breeds. Melanomas were reported as particularly prone to be involved with the eyelid and that breeds with moderate to heavy pigmentation of the skin were especially susceptible.

In another report, Mulligan (1949) stated that the predilection of melanomas for the eyelid was especially noteworthy. He suggested that the larger melanomas (6 cc. to 8 cc.) had a 70-80% chance of malignancy, and that the more anaplastic cells of malignant tumors contained less melanin. Irritation or incomplete surgical removal was mentioned as a possible factor which caused benign melanomas to become malignant.

C. Neoplasms of the Cutaneous System

Nielsen and Cole (1960) made a study of cutaneous epithelial neoplasms found on 153 dogs. Most of the tumors observed were basal cell tumors, squamous cell carcinomas or sebaceous gland tumors. No mention was made, however, as to their specific location on eyelids.

In a survey conducted by Sedlmeier and Weiss (1963), 877 skin tumors were collected over a 5-year period at the University of Munich. They reported 549 tumors of epithelial origin and 328 tumors of mesenchymal origin. In both types, slightly over one-half of the cutaneous neoplasms were considered malignant.

Cotchin (1954) surveyed 932 tumors of the cutaneous system, collected during the period 1940-1953 by the Department of Pathology, Royal Veterinary College, London. The neoplasms of the skin were classified into basic cell types as follows: 344 (40%) connective tissue type, 276 (30%) epithelial, 164 (18%) melanomas, and 118 (12%) as undiagnosed or miscellaneous. In light of the high incidence of melanomas, these tumors were studied in detail and 3 basic types were described; malignant melanoma, benign cellular melanoma, and benign fibrous melanoma. The benign types were frequently pedunculated while the malignant type was often ulcerated. It was stated that melanomas of the skin of dogs appear to be more frequently benign than malignant, while the converse is true with oral melanomas.

In another report by Cotchin (1955), 101 melanotic tumors were studied, 81 of which occurred in the skin. There was no evidence of sex predisposition; however, there was an indication that the Scottish Terrier was prone to melanotic tumors. Of the 81 tumors of the skin, only 1 was found on the eyelid and it was classified as benign.

Sarcomas of canine skin were studied by Douglas (1951), and in his opinion this tumor type tended toward rapid growth, ulceration and marked increase in the thickness of the skin. He indicated that sarcomas definitely occur in eyelids and in this location they are usually small diffuse tumors often extending over the edge of the eyelid. He further suggested that the frequent recurrence of sarcomas may be the result of incomplete surgical removal.

Average age incidence of cutaneous neoplasms reported by Cotchin (1955) was 8.8 years for melanomas. Mulligan (1944) reported 6 to 10 years as the most common age group for dogs with skin tumors. He further suggested that the presence of tumors in dogs is dependent on survival to old age. After further study Mulligan (1949) reported a wider age range for cutaneous tumors. Neoplasms of squamous and basal cells, as well as fibropapillomas, were most common from 7 to 14 years of age. Sebaceous gland neoplasms were most common in dogs 11 years of age or older.

D. Clinical Significance of Eyelid Tumors

Uberreiter (1959) stated that the treatment of eyelid tumors depended not only on the nature of the tumor (benign or malignant) but also on the location. Critically placed benign tumors were frequently more difficult to remove than malignant tumors located at more favorable sites. Neoplasms involving the skin of the eyelid usually allowed complete surgical removal and hence a favorable prognosis. However, neoplasms involving the conjunctiva were more dangerous, particularly when located near the medial canthus. At this site the lacrimal ducts may become involved and the tumor may encroach on the bony orbit. Uberreiter stated that

sebaceous gland tumors were especially frequent in the eyelids of dogs. Fibromas and papillomas, with broad basal attachments, often recurred where liberal excision was not performed.

Magrane (1965) stated that papillomas were the most commonly encountered growths on the canine eyelid. He described surgical removal as a simple procedure and suggested the use of electrocautery, or scissors and silver nitrate cautery.

Roberts (1965) stated that neoplasms of the eyelid were common in dogs, with sebaceous adenomas being the type most frequently encountered. He divided eyelid tumors into benign (adenoma, papilloma, nevus, verruca, fibroma) and malignant forms (squamous and basal cell carcinoma, melanoma, adenocarcinoma). It was indicated that the surgical procedure used to remove eyelid neoplasms was dictated by size, position and growth characteristics of the tumor. While small pedunculated masses were simply excised at the base, more diffuse neoplasms required radical excision of the full thickness of the eyelid.

Innes and Whittick (1943) reported metastasis of a sebaceous-type carcinoma of the meibomian glands in a dog, to the cervical lymph nodes.

In Progress in Canine Practice (1967, Part II, edited by B. J. Catcott and J. F. Smithcors), Abe (1963) reported a black wart-like neoplasm that appeared in the eyelid of a 15-year-old mongrel bitch. It was soft and fragile with an ulcerated external surface and, after surgical removal, was histologically classified as a melanoma. Three months later the growth recurred and the animal was euthanatized. The melanoma had spread to the orbit and displaced the ocular globe.

E. Eyelid Tumors in Man

O'Brien and Braley (1936) stated that tumors of the eyelids in man were common and frequently originated from the skin. They suggested that the majority of these tumors was benign.

Kwitko, Boniuk and Zimmerman (1963) made a survey of 1176 eyelid lesions and reported 550 malignant neoplasms, 415 benign neoplasms and 211 inflammatory lesions or cysts. Basal cell carcinomas were diagnosed in 91.2% of the malignant neoplasms.

Martin (1939) made a study of the topographic incidence of eyelid tumors and found 54% on the lower eyelid, 13% on the upper eyelid, 28% on the medial canthus and 5% on the lateral canthus. He also stated that the average age incidence of eyelid tumors was 54 years, and the comparative incidence was 57% in men and 43% in women.

MATERIALS AND METHODS

The neoplastic tissues used for this study were collected over a 12-year period from July 1, 1956, to July 1, 1968. These tissues were submitted to the Department of Pathology, Michigan State University, and were received from veterinary practitioners. Approximately 1/3 of the specimens was obtained from the Department of Veterinary Surgery and Medicine, Michigan State University. Less than 5% of the tissues were received from veterinarians from the neighboring states of Illinois, Indiana and Ohio.

Tissues were fixed in 10% formalin and those samples mailed in by practitioners were accompanied by a brief report which included species, gross appearance, sex, age and breed. Unfortunately, not all tissues were accompanied by a complete history; however, data presented are based on information received with the specimen.

When the specimens were received each was assigned a number, trimmed and processed in an Autotechnicon.* Tissues were embedded in Paraplast** or Tissuemat*** and sections were cut at 6 microns. All slides were stained with hematoxylin and eosin in the manner described in the Manual of Histologic and Special Staining Technics of the Armed Forces Institute of Pathology, Washington, D.C. (1957). Examination of the tissues was accomplished by light microscopy.

* Technicon Co., Chauncey, N.Y.

** Aloe Scientific Division of Brunswick, St. Louis, Mo.

*** Fisher Scientific Co., Chicago, Ill.

Gross photographs were taken of the neoplasms on those animals admitted to the Department of Veterinary Surgery and Medicine. Photomicrographs were taken of representative types of the more common neoplasms encountered.

RESULTS

One hundred seven neoplasms removed from eyelids of dogs were examined microscopically. Fifteen additional specimens were examined but were not included in this study. Six of these involved the membrana nictitans and not the external eyelids, 6 were inflammatory lesions, and 3 were eyelid neoplasms from other species.

The 107 neoplasms were removed from 98 dogs representing 35 different breeds and a group of 10 mongrel dogs. Seventeen tumors were submitted from the eyelids of Cocker Spaniels, while the next highest incidence was 5 neoplasms in one breed.

Average age of the dogs at the time of surgical removal was 8.4 years, while the mean age was 8.5 years. The oldest dog affected was 15, and the youngest was only 2 years of age.

Sex incidence of eyelid neoplasms was nearly the same with 50 male and 48 female dogs affected.

Forty-five of the neoplasms were removed from upper eyelids, compared with 33 excised from lower eyelids. The incidence of occurrence on upper eyelids compared with lower eyelids was nearly equal in all tumor types except malignant melanomas and sebaceous adenocarcinomas. Malignant melanomas were found on 6 upper and 1 lower eyelid and sebaceous adenocarcinomas were found on 10 upper and 4 lower eyelids. Three tumors were removed from the medial canthus and 4 from the lateral canthus.

Multiple neoplasms occurred on the eyelids of 9 dogs. Four dogs had a single tumor on 2 different eyelids, while dual tumors were present

on a single eyelid of 5 dogs (Figure 1).

Size estimates were made of 47 of the neoplasms used in this study. The largest tumor was a neurofibrosarcoma taken from the upper eyelid of a 4-year-old German Shepherd, and measured 20 x 20 x 25 mm. (10,000 cmm.). The smallest tumor was a sebaceous adenoma measuring 2 x 2 x 1 mm. (4 cmm.) removed from an 8-year-old Beagle. The average size of the 47 specimens with recorded dimensions was approximately 844 cmm. Determinations were estimates, made prior to surgical removal, and were arrived at by many different veterinarians.

Microscopically, the neoplasms most frequently encountered were sebaceous gland tumors (47 or 43.9%), melanomas (25 or 23.4%), and papillomas (22 or 20.6%). The remaining tumors (13 or 12.1%) represented a miscellaneous aggregation of 10 different types of neoplasms.

Seventy-five neoplasms (70%) were classified as benign and 32 (30%) were considered malignant. The neoplasms that reportedly recurred after surgical removal were: sebaceous adenocarcinomas (3), squamous cell carcinoma (1), malignant melanoma (1), and hemangiopericytoma (1).

Epithelial tumors outnumbered those of mesenchymal origin 73 to 9. The other 25 tumors were melanomas and were not included in this comparison due to the difficulty in identification of a specific cell of origin. Histologically, some melanomas resembled sarcomas, while others resembled carcinomas.

The comparative incidence of major types of neoplasms found in canine eyelids is graphically presented in Figure 2. A further breakdown of these major types appears in Table 1.



Figure 1. Two neoplasms on the left lower eyelid. The small neoplasm (left) was a sebaceous adenoma and the large neoplasm (right) was a melanoma. x 2.

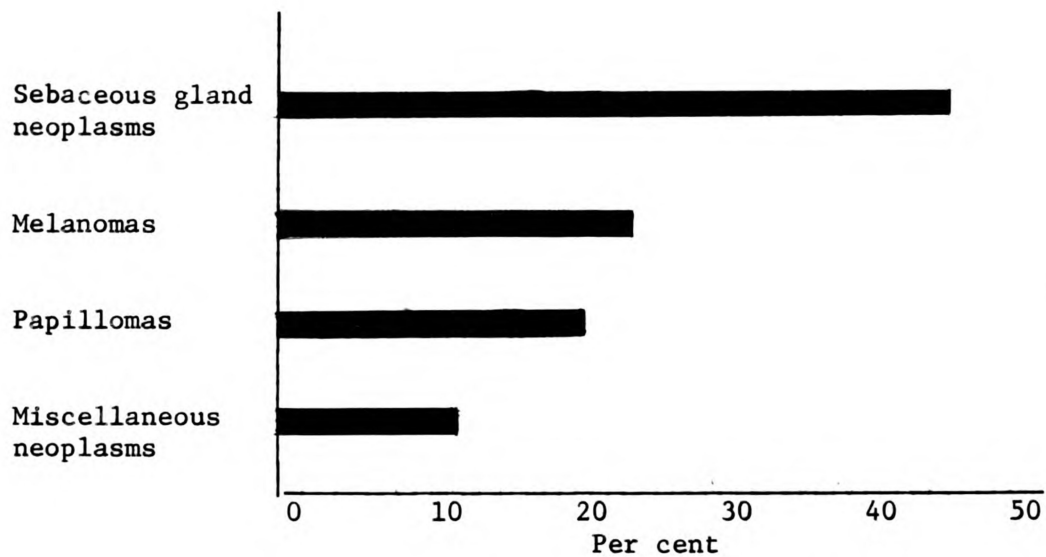


Figure 2. Major eyelid neoplasms of dogs.

Table 1. Incidence of eyelid neoplasms

	Numbers	Per cent
Sebaceous adenoma	19	17.8
Sebaceous adenocarcinoma	18	16.9
Pigmented sebaceous adenoma	10	9.3
Benign melanoma	15	14.0
Malignant melanoma	10	9.3
Squamous papilloma	22	20.6
Miscellaneous neoplasms	<u>13</u>	<u>12.1</u>
TOTAL	107	100.0

A. Squamous Papilloma

The mean age of incidence of this neoplasm was 6.5 years and the average size of 9 tumors measured was 72 cmm.

The gross appearance of this neoplasm was that of one or more papillary elevations projecting from a common broad base or a pedunculated stalk. They were frequently covered by hairless, keratinized skin (Figure 3).

Microscopically, this neoplasm was characterized by papillary projections consisting of a connective tissue core surrounded by proliferating squamous epithelium. Hyperkeratosis and acanthosis were noted in varying degrees in all neoplasms (Figure 4).

B. Sebaceous Gland Tumors

1. Sebaceous adenomas. The mean age of incidence of this neoplasm was 9 years and the average size of 10 neoplasms measured was 327 cmm.

The gross appearance of this neoplasm had one of two forms: (1) a smooth encapsulated nodule that was embedded in the conjunctival surface of the eyelid (Figure 5), or (2) a cauliflower-like, pedunculated mass located on or near the edge of the eyelid.

There was some variation in the microscopic appearance of this neoplasm. The smooth nodular neoplasm usually consisted of a thickened external capsule, inside of which were numerous packets of cells separated by thin connective tissue septa (Figure 6). Many of these cells were multivacuolate and surrounded by rows of small reserve cells. The other form of this neoplasm usually lacked a peripheral capsule. However, cellular morphology was essentially the same for both types of sebaceous adenomas.



Figure 3. A squamous papilloma on the left upper eyelid. Note the multiple papillary projections. x 4.

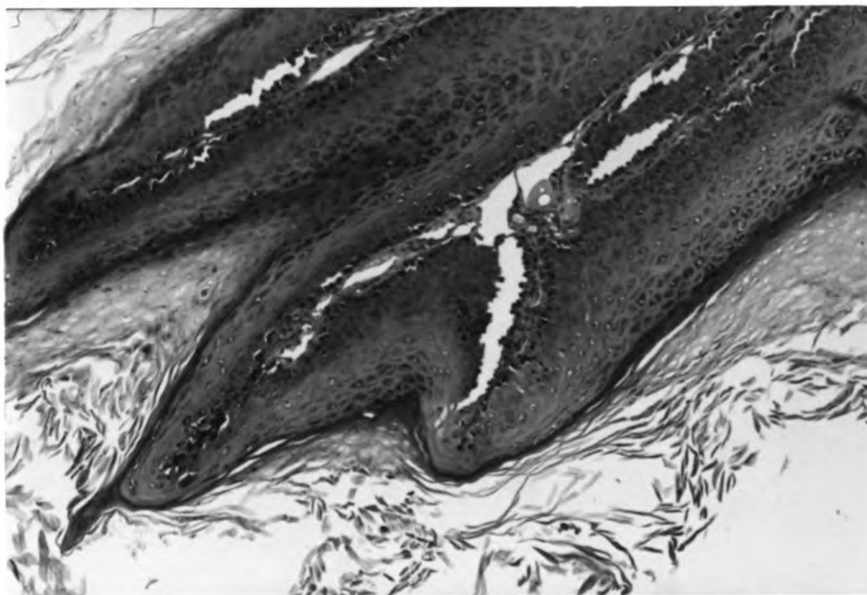


Figure 4. Photomicrograph of the squamous papilloma in Figure 3. Note hyperkeratosis and the proliferated squamous epithelium. Hematoxylin and eosin. x 40.

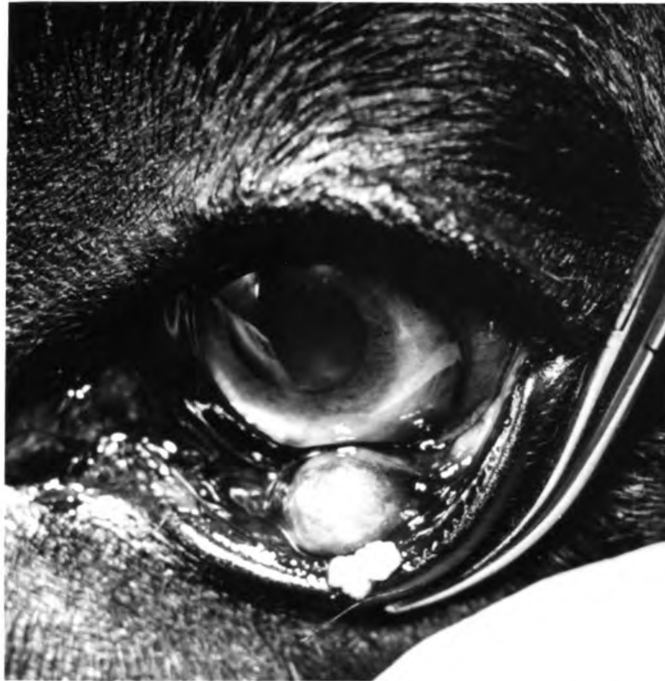


Figure 5. A sebaceous adenoma on the conjunctival surface of the left lower eyelid. The irregular white mass at the edge of the eyelid was a squamous papilloma. x 2.

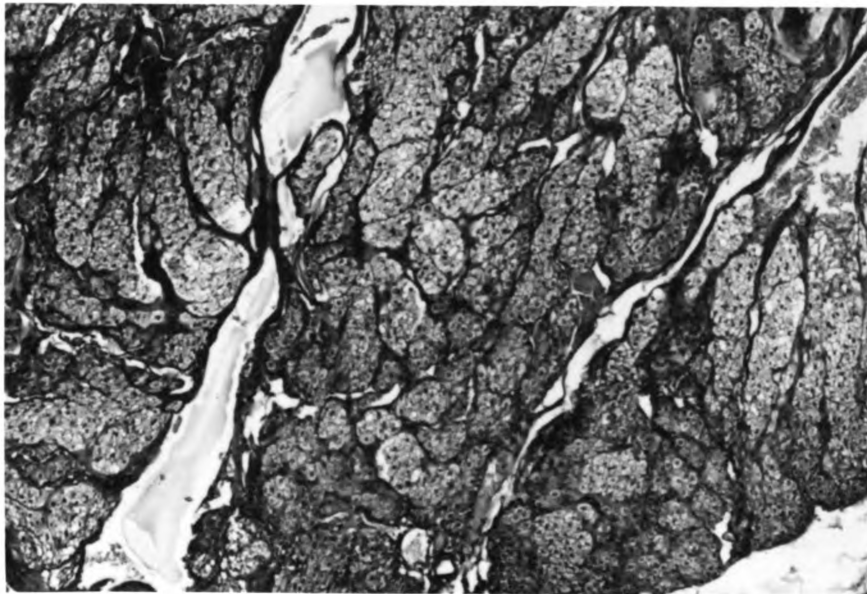


Figure 6. Photomicrograph of the sebaceous adenoma in Figure 5. Note the individual packets of sebaceous cells separated by connective tissue septa. Hematoxylin and eosin. x 40.

2. Pigmented Sebaceous Adenomas. The mean age of incidence of this neoplasm was 7.5 years and the average size of 3 tumors measured was 416 cmm. None of these neoplasms was observed grossly; however, microscopically there was a noticeable intermingling of pigmented cells among neoplastic sebaceous elements (Figure 7). Melanoblasts appeared to extend down from the epidermal-dermal junction surrounding nests of immature sebaceous cells. Adenomatous changes were predominant, but due to the marked increase in pigmented cells a separate classification was established for these neoplasms.

3. Sebaceous Adenocarcinomas. The mean age of incidence of this neoplasm was 9.5 years and the average size of 10 neoplasms measured was 1447 cmm. This neoplasm occurred in 10 upper eyelids and only 4 lower eyelids.

Only one adenocarcinoma was observed grossly, and it appeared inflamed and ulcerated (Figure 8). This neoplasm had a much broader base than any of the adenomas observed.

Microscopically, this neoplasm generally resembled the benign forms except that the tumor cells were more pleomorphic and mitotic figures were numerous (Figure 9). The basic structure of packets of sebaceous cells was the same as in the sebaceous adenoma, but the adenocarcinomas were invasive and anaplastic.

C. Melanomas

The mean age of incidence of this neoplasm was 9.8 years, and the average size of 1 malignant and 9 benign neoplasms measured was 406 cmm.

The gross appearance of this neoplasm had one of two forms: (1) a smooth rounded mass which was usually pedunculated (Figure 10), or (2) a very irregular, granular nodule that was often ulcerated and inflamed (Figure 12). All of the melanomas had some degree of melanin pigmentation.

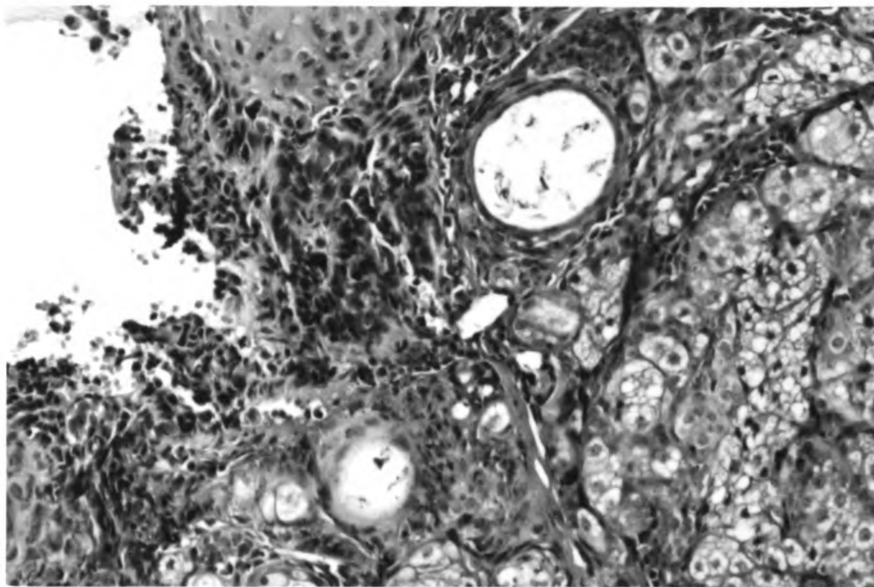


Figure 7. Photomicrograph of a pigmented sebaceous adenoma. Note the mixture of pigmented and sebaceous cells. Hematoxylin and eosin. x 100.



Figure 8. A sebaceous adenocarcinoma (A) on the edge of the right lower eyelid. The membrana nictitans (B) covered the lower portion of the eye to prevent corneal irritation. x 2.

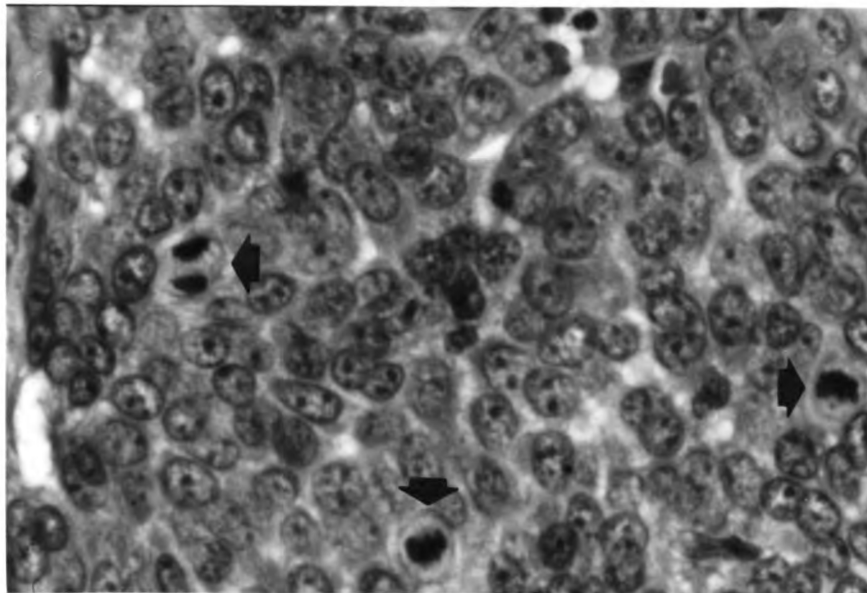


Figure 9. Photomicrograph of a sebaceous adenocarcinoma. Note the numerous mitotic figures (arrows). Hematoxylin and eosin. x 400.

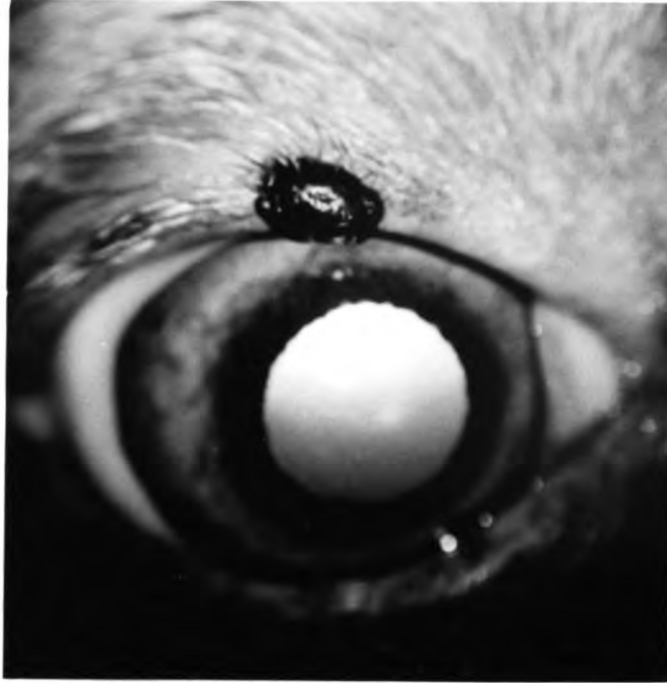


Figure 10. A benign melanoma on the dermal edge of the right upper eyelid. Note the very dark black appearance. x 4.

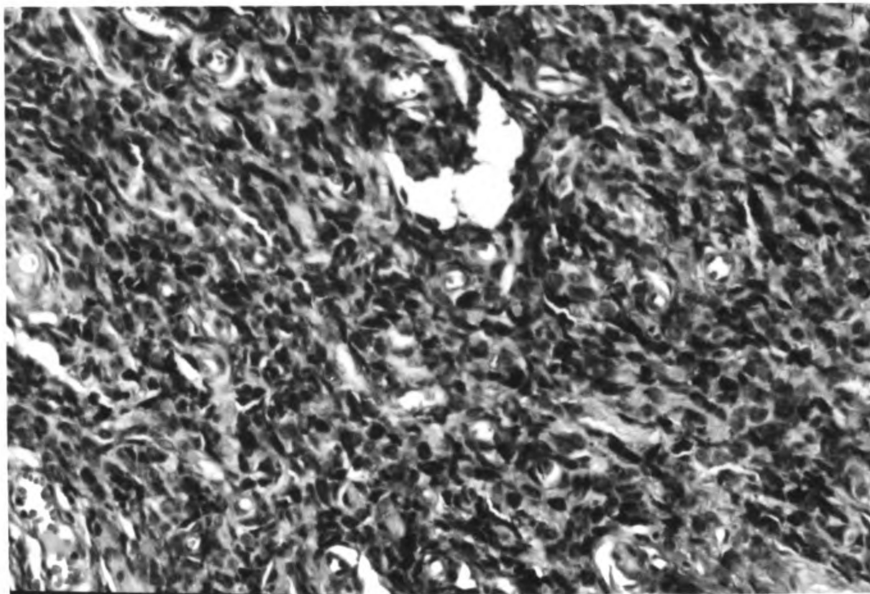


Figure 11. Photomicrograph of a benign melanoma. Note the compact arrangement of melanocytes. Hematoxylin and eosin. x 100.



Figure 12. A malignant melanoma on the conjunctival surface of the left upper eyelid. Note the secondary pigmentation on the opaque cornea. x 4.

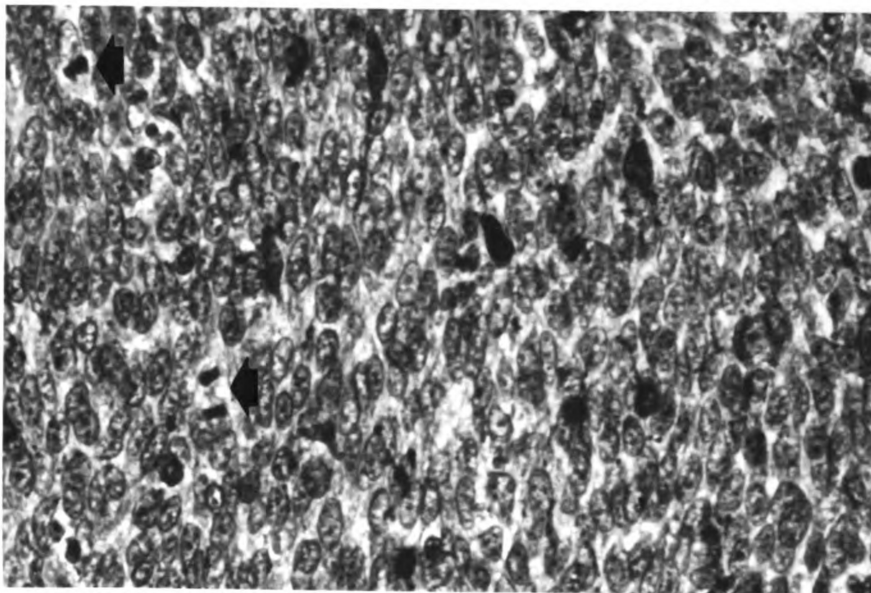


Figure 13. Photomicrograph of a malignant melanoma. Note the mitotic figures (arrows). Hematoxylin and eosin. x 400.

The microscopic characteristics of melanomas were variable, but 3 general types were observed. One type was well differentiated and consisted of compactly arranged melanocytes (Figure 11). These cells were often compressed into spindle shapes and contained pigment granules. Melanin content in this type ranged from scant to abundant and in the latter case often obscured nuclear detail. Grossly these neoplasms often appeared as pedunculated spheres.

In contrast to this type were those melanomas that were highly undifferentiated. This type of melanoma was composed of large polyhedral cells that varied in size and shape and had frequent and abnormal mitotic figures (Figure 13). Melanin content was moderate to scant and secondary inflammation frequently accompanied ulceration. These neoplasms had the anaplastic characteristics of malignancy.

The third type of melanoma was intermediate between the two already described. Differentiation was poor and cells appeared round to polyhedral in outline. Hyperchromasia and atypical mitoses were infrequent; however, areas of cellular pleomorphism were evident. Melanin content was variable as was secondary inflammation.

D. Miscellaneous

The classification of the miscellaneous neoplasms is given in Table 2. Gross observations of these neoplasms were not available and microscopic characteristics were typical for the individual tumor type. Since these neoplasms occurred infrequently, detailed descriptions are not included in this thesis.

Table 2. Incidence of miscellaneous neoplasms

Type of Neoplasm	Number Observed
Squamous cell carcinoma	2
Fibroma	2
Fibropapilloma	2
Lipoma	1
Histiocytoma	1
Basal cell carcinoma	1
Mastocytoma	1
Hemangiopericytoma	1
Neurofibroma	1
Neurofibrosarcoma	<u>1</u>
TOTAL	13

DISCUSSION

This study indicated that histogenetically there were 3 major tumor types commonly found in the eyelids of dogs, namely sebaceous gland tumors, melanomas, and papillomas.

Sebaceous gland tumors were the most frequently encountered neoplasm, comprising 44.3% of the total studied. These findings concur with the report by Poppensiek (1961) and with the suggestions of Roberts (1965) and Jubb and Kennedy (1963). However, Magrane (1965) reported that papillomas were seen most frequently on canine eyelids.

In any survey the results obtained are dependent on the choice of material and the manner in which it is reviewed. Surveys may be based on clinical impressions, histopathologic identification, or combined gross and microscopic examination. While the gross appearance of a neoplasm may give some indication of tumor type, optimal accuracy may be achieved by a combination of clinical observation and histopathologic examination of neoplasms.

In general the benign sebaceous tumors appeared innocuous both grossly and microscopically. The separate category, pigmented sebaceous adenomas, was established due to the difficulty encountered in determining predominance of adenomatous or melanotic changes. This problem was most challenging and, in view of inconsistencies which result from choosing one of two nearly equal pathologic changes, the combined classification was adopted.

Malignant sebaceous neoplasms and malignant melanomas both occurred on upper eyelids more frequently than on lower eyelids. However, the benign forms of both tumor types had nearly the same incidence of occurrence on upper and lower eyelids. These results suggest that malignant tumors occur most frequently on the upper eyelid. This represents only 21 neoplasms and, before suggesting that upper eyelids are more prone to malignant tumors, a larger number should be surveyed.

Melanomas were reported as nearly the same average size as sebaceous adenomas. It should be pointed out that these size estimates were made on 9 benign and only 1 malignant melanoma. The 3 types of melanomas observed in this study were similar to the 3 basic cell types described by Cotchin (1954). Benign melanomas were easily distinguished from highly malignant anaplastic types; however, there were several neoplasms between these types that were difficult to classify.

Intermediate melanomas which displayed the greatest tendency toward cellular irregularity, abnormal mitosis, and invasive growth were classified as malignant. Those intermediate melanomas which lacked these characteristics were considered benign.

Squamous papillomas were the smallest of all groups of eyelid neoplasms. These tumors also had the lowest mean age of incidence (6.5 years), which concurred with Mulligan's (1949) suggestion that papillomas occur in young dogs. Schwartzman and Orkin (1962) reported nearly the same age incidence (6.8 years) for dogs affected with viral papillomas. The neoplasms included in their study were taken from all parts of the body and not specifically eyelids.

Sebaceous tumors and melanomas affected dogs 3 years older than the mean age incidence of dogs affected with papillomas. This concurred

with the age reported by Mulligan (1949) for neoplasms of the cutaneous system of dogs.

The high incidence of epithelial neoplasms, compared with those of mesenchymal origin, concurred with the findings of Mulligan (1949) and Seidlmeir and Weiss (1963) in their studies of cutaneous neoplasms. The latter workers reported that over one-half of cutaneous neoplasms were malignant. In this study only 30% of eyelid neoplasms were malignant compared with 70% benign.

A relatively high occurrence of eyelid tumors was noted in Cocker Spaniels. This breed is very popular and it is possible that Cocker Spaniels were seen more frequently than dogs of other breeds. Thus, the high breed incidence may have resulted from the density of this breed in the dog populations sampled.

The classification proposed in this study was adopted after carefully allocating similar tumors into separate groups. Although the neoplasms within these groups were similar, individual differences were observed. Much of this variation was probably due to the multiple tissue architecture of the eyelid. Classifications tend to be somewhat arbitrary, but it was evident that sebaceous gland tissues were most frequently involved in neoplastic processes of the eyelids of dogs.

SUMMARY

The purpose of this study was to histologically classify canine eyelid neoplasms submitted to the Department of Pathology, Michigan State University, during a period of 12 years and to observe the gross appearance of eyelid tumors in dogs admitted to the Michigan State University Veterinary Clinic for one year.

The 107 neoplasms examined were classified histogenically into 3 major tumor types and a group of miscellaneous neoplasms. The incidence of occurrence of these major types was: sebaceous gland neoplasms, 43.9% (47); melanomas, 23.4% (25); papillomas, 20.6% (22); and miscellaneous neoplasms, 12.1% (13).

Seventy per cent of the neoplasms were benign and 30% were malignant. Forty-five neoplasms were removed from upper eyelids and 33 were removed from lower eyelids. Malignant melanomas and sebaceous adenocarcinomas occurred on upper eyelids more frequently than on lower eyelids.

Of the 35 breeds represented in this study, Cocker Spaniels had the highest incidence of eyelid neoplasms.

The gross appearance of eyelid neoplasms revealed a general trend toward pedunculation or encapsulation of benign tumors while malignant neoplasms were invasive and diffusely attached. Hyperpigmentation of eyelid neoplasms was frequently noted.

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VITA

The author was born in Pretty Prairie, Kansas, on April 17, 1936. He received his primary and secondary education in the public schools of Pretty Prairie, Kansas. After graduation from high school in 1954 he continued his education at Bethel College, North Newton, Kansas. In 1956 he transferred to Kansas State University and entered the College of Veterinary Medicine in September, 1958.

During his professional schooling he served as president of his fraternity, represented the student chapter at the A.V.M.A. convention in 1961, and was elected to Blue Key, all-university senior men's honorary.

He received his D.V.M. degree in June of 1962 and entered small animal practice in association with Dr. R. L. Russell in Mesa, Arizona. In August, 1963, he moved to El Cajon, California, where he was in general practice, associated with Drs. W. J. Dedrick and A. L. Davis.

In 1964 he entered the U.S. Air Force and served as base veterinarian for 2 years at Andersen Air Force Base, Guam. During his tour of duty on Guam he also provided veterinary service to the Department of Agriculture on the island.

After completing his military service he joined the Department of Veterinary Surgery and Medicine at Michigan State University. While serving in that department he entered the graduate school, majoring in veterinary pathology. His current appointment as instructor in veterinary surgery and medicine was July 1, 1966.

The author married Linda Jean Bunch in 1963, and they have 2 children: Douglas Jan, 4, and Carrie Ladell, 1.

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45

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