



# The investigation of histopathology and locations of excised eyelid masses in dogs

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**To cite:** Wang S-L, Dawson C, Wei L-N, *et al.* The investigation of histopathology and locations of excised eyelid masses in dogs. *Veterinary Record Open* 2019;**6**:e000344. doi:10.1136/vetreco-2019-000344

Received 22 March 2019  
Revised 28 November 2019  
Accepted 29 November 2019

## ABSTRACT

**Background** Eyelid masses are the most common ocular diseases in dogs. However, there are no studies specifically investigating the location of eyelid masses.

**Methods** 118 dogs with 119 eyelid masses were included. Medical records and pathology reports were retrospectively reviewed at National Taiwan University veterinary hospital and Vision Eyecare Centre for Animals between 2012 and 2017.

**Results** Mean age of dogs was 9.4±2.5 years. Female spayed dogs had significantly higher prevalence of eyelid mass than female intact dogs ( $p<0.01$ ). Prevalence of upper eyelid mass was significantly higher than lower eyelid mass ( $p<0.01$ ). The upper lateral eyelid was the significantly more common location compared with the upper medial eyelid. Mean mass volume was 258.2±661.0 mm<sup>3</sup>. The most common eyelid mass type was meibomian epithelioma (34.5%), followed by meibomian adenoma (29.4%) and meibomian hyperplasia (18.5%). Non-tumours comprised 25.2%, benign tumours comprised 67.2% and malignant tumours comprised 7.6% of all eyelid masses. Malignant tumours were significantly larger than benign lesions ( $p<0.01$ ). All dogs underwent surgical excision without any complications.

**Conclusion** The majority of eyelid masses were benign. Surgical intervention can prevent further ocular irritation and provide good prognosis.

## INTRODUCTION

The eyelids cover the globe and orbit and provide protection to the globe itself. Eyelid disease in dogs is a common problem in veterinary ophthalmology. It includes congenital abnormalities, inflammatory, trauma, immune-mediated disease, and neoplasia.

Eyelid neoplasms are the most common periocular tumour in dogs.<sup>1</sup> They can arise from epithelial, mesenchymal and round cell origin, similar to those that occur in other areas of skin.<sup>2</sup> Most eyelid tumours are benign, slow growing over months to years, and usually with unilateral involvement.<sup>3</sup> Large eyelid tumours may rub the cornea and result in ocular discharge, conjunctival hyperaemia and corneal ulceration. There are studies that look into the prevalence of eyelid neoplasms; and sebaceous adenoma was the most common tumour, comprising 31%–60%

of cases.<sup>4–6</sup> Other tumours that involve the eyelid included sebaceous carcinoma, sebaceous epithelioma, melanoma, mastocytoma, basal cell tumour and histiocytoma.<sup>3 7 8</sup> The meibomian glands are sebaceous glands embedded in the area of the tarsal plate of eyelids. Therefore, some veterinary pathologists use meibomian gland instead of sebaceous gland in nomenclature.

To the authors knowledge, previous studies only divided eyelid masses into either an upper eyelid mass or a lower eyelid mass. Krehbiel and Langham found the occurrence of upper eyelid tumours (40.2%) was higher than lower eyelid tumour (30.2%).<sup>1</sup> The specifics regarding location of upper and lower eyelid masses was not recorded or analysed. The aim of this study was to describe the clinical characteristics, mass locations and histopathology findings of canine eyelid masses.

## MATERIALS AND METHODS

The medical records and pathology reports were retrospectively reviewed at National Taiwan University veterinary hospital and Vision Eyecare Centre for Animals between 2012 and 2017. All dogs included in this study were diagnosed as having an eyelid mass that underwent surgical excision and histopathological examination. We collected data of breed, age, sex, mass size (after surgical excision), mass location, surgical procedure, pathologic results and follow-up conditions. Mass size was calculated using the three basic measurements (length, width and height) of mass. Almost all masses were not rectangles in shape, we used the longest diameter in each direction to record the volume. The upper and lower eyelids were divided into three parts with equal length. Mass location was categorised as upper lateral, upper central, upper medial, lower lateral, lower central and lower medial. The excised specimens were fixed in 10% formalin for histopathological analysis by the pathologist of National Taiwan University.



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**Table 1** Breed of the dogs with eyelid mass

Breed	Number
Mixed	17
Labrador Retriever	13
Toy Poodle	11
Golden Retriever	10
Shih Tzu	10
Beagle	9
Miniature Schnauzer	8
Maltese Terrier	6
Dachshund	5
Welsh Corgi	5
Husky	5
Chihuahua	3
French Bull Dog	3
Pug	2
Yorkshire Terrier	2
Boxer	1
English Bull Dog	1
Fox Terrier	1
Jack Russell Terrier	1
Japanese Spitz	1
Old English Sheepdog	1
Pomeranian	1
Shiba Inu	1
West Highland White Terrier	1

All specimens were initially stained using haematoxylin and eosin, additional staining was performed if more information was required. Any patient that had received previous eyelid surgery was excluded from the study.

Comparisons among mass occurrence and sex, mass occurrence and neuter status, mass occurrence and mass location and malignancy and mass location were analysed using the  $\chi^2$  distribution. The comparisons of mass size and malignancy as well as mass size and location were analysed by student's t-test and one-way analysis of variance. All statistical analyses were considered significant at  $p < 0.05$ .

## RESULTS

There were 119 eyelid masses obtained from 118 dogs included in this study. Most dogs in this study were mixed breed ( $n=17$ ), the distribution of breeds is displayed in [table 1](#).

The age of dogs included in this study was  $9.4 \pm 2.5$  years (mean  $\pm$  SD). In all, 51 dogs were male (24 intact and 27 castrated), 60 dogs were female (17 intact and 43 spayed) and seven dogs the sex was not recorded. There was no significant difference of mass occurrence between male and female dogs ( $p=0.39$ ). Neuter status of male dogs

**Table 2** The sex and neuter status of the dogs

Sex	Status	Number
Male ( $n=51$ )*	Intact†	24
	castrated†	27
Female ( $n=60$ )*	Intact‡	17
	Spayed‡	43
Unknown ( $n=7$ )	Unknown	7

\*There was no significant difference in tumour occurrence between male and female dogs ( $p=0.39$ ).

†There was no significant difference in tumour occurrence between intact and castrated male dogs ( $p=0.67$ ).

‡Spayed female dogs exhibited a significantly higher prevalence of eyelid tumour compared with intact females ( $p < 0.01$ ).

did not significantly impact mass occurrence ( $p=0.67$ ). Female spayed dogs had a significantly higher prevalence of eyelid masses compared with intact females ( $p < 0.01$ ) ([table 2](#)).

There were 73 masses located on the upper eyelid (28 upper lateral, 16 upper central, 10 upper medial and 19 mass locations were not recorded). In all, 45 masses were located on the lower eyelid (6 lower lateral, 12 lower central, 15 lower medial and 12 masses were not recorded). One mass location was not recorded. The upper eyelid showed a significantly higher prevalence of eyelid masses than the lower eyelid ( $p < 0.01$ ). For upper eyelid masses, there was a significant difference between lateral, central and medial locations ( $p < 0.01$ ). Lateral eyelid location was a significantly more common location of mass than the medial eyelid. For the lower eyelid masses, there was no significant difference between mass locations ( $p=0.15$ ) ([table 3](#)).

The median overall mass volume was  $258.2 \pm 661.0 \text{ mm}^3$  (range from  $1 \text{ mm}^3$  to  $6000 \text{ mm}^3$ ). The mass size was recorded from 25 upper lateral, 15 upper central, 10 upper medial, 6 lower lateral, 12 lower central and 13

**Table 3** The locations of eyelid masses

Eyelid	Location	Number
Upper ( $n=73$ )*	Lateral†	28
	Central†	16
	Medial†	10
	Unknown	19
Lower ( $n=45$ )*	Lateral‡	6
	Central‡	12
	Medial‡	15
	Unknown	12
Unknown ( $n=1$ )	Unknown	1

\*The upper eyelid showed a significantly higher prevalence of eyelid tumour than the lower eyelid ( $p < 0.01$ ).

†For upper eyelid tumours, there was a significant difference between lateral, central and medial locations ( $p < 0.01$ ).

‡For the lower eyelid tumours, there was no significant difference between tumour locations ( $p=0.15$ ).

**Table 4** Median mass size of different locations

Location		Number	Size (mm <sup>3</sup> )	SD	P value
Upper eyelid*	Upper lateral†	25	252.36	504.48	0.93
	Upper central†	15	305.5333	543.53	
	Upper medial†	10	239.6	299.08	
Lower eyelid*	Lower lateral‡	6	118.1667	122.40	0.22
	Lower central‡	12	90.5	163.04	
	Lower medial‡	13	254.3846	306.63	

\*There was no significant difference in tumour size between the location of upper and lower eyelid ( $p=0.13$ ).

†Tumour size between upper lateral, upper central and upper medial locations showed no significant difference ( $p=0.93$ ).

‡There was no significant difference in tumour size between the location of lower lateral, lower central and lower medial eyelid ( $p=0.22$ ).

lower lateral eyelid masses. In seven dogs the size of eyelid mass was not recorded. There was no significant difference in mass size between the upper and lower eyelid ( $p=0.13$ ). Mass size between upper lateral, upper central and upper medial locations showed no significant difference ( $p=0.93$ ). There was no significant difference of mass size between the location of lower lateral, lower central and lower medial eyelid ( $p=0.22$ ) (table 4).

Based on the histopathological results, the most frequent eyelid abnormalities was meibomian epithelioma ( $n=41$ ), followed by meibomian adenoma ( $n=35$ ), meibomian hyperplasia ( $n=22$ ), meibomian carcinoma ( $n=6$ ), blepharitis ( $n=4$ ), melanoma ( $n=3$ ), cyst ( $n=3$ ), papilloma ( $n=2$ ), and one each of adenitis, basal cell tumour and histiocytoma (table 5). Non-tumours comprised 25.2% (30/119), benign tumours comprised 67.2% (80/119) and malignant tumours comprised 7.6% (9/119) of all eyelid masses in this study population. The prevalence of benign lesions (non-tumours and benign tumours) was significantly higher than malignant tumours ( $p<0.01$ ). The volume of malignant tumours and benign lesions was  $824.8\pm 1853.6\text{ mm}^3$  and  $198.2\pm 376.0\text{ mm}^3$  respectively. Malignant tumours were significantly larger than benign lesions ( $p<0.01$ ).

**Table 5** Histopathologic results of eyelid masses

	Number
Meibomian epithelioma	41
Meibomian adenoma	35
Meibomian hyperplasia	22
Meibomian carcinoma	6
Blepharitis	4
Melanoma	3
Cyst	3
Papilloma	2
Adenitis	1
Basal cell tumour	1
Histiocytoma	1

## DISCUSSION

In previous veterinary literature, eyelid tumours reportedly usually occur in older dogs, the average age was reported from 8 to 9.6 years.<sup>1,5</sup> The average age of dogs included in this study was 9.4 years which is in alignment with the other studies. The most commonly affected breeds in this study were mixed breed, Labrador Retriever, Toy Poodle, Golden Retriever, and Shih Tzu which comprised 14.4%, 11.0%, 9.3%, 8.5% and 8.5% of the study population. To our knowledge, there have been no previous study reporting breed predisposition to developing eyelid masses. This result should be taken into account with geographical differences.

There was no significant difference of mass occurrence between sexes. However, female spayed dogs more commonly had eyelid masses than intact females. A possible explanation for this finding was that if owners were willing to neuter their dog, perhaps they would be more observant to other conditions, such as eyelid masses and the recommended treatments, such as surgery. However, this was not consistent for the male dogs. It was not possible to compare this result to the sex of whole population in our hospital during the period time of this study, which would be very interesting. Further studies are needed to investigate this finding.

The clinical characteristics of meibomian gland tumours were similar. They usually appear as tan, pink, grey or black masses extending from the meibomian gland openings. They usually have an irregular surface and easily haemorrhage when traumatised.<sup>6</sup> Other less common tumours include fibroma, basal cell tumour and histiocytoma and are usually characterised by a smooth, hairless, pink exterior with a sessile base.<sup>9</sup>

The occurrence of upper eyelid masses was significantly more common than lower eyelid masses in this study. A possible explanation for this was the necessity of surgery of masses in this location. The upper eyelid is the most important eyelid to move over the corneal surface during blinking, thus upper eyelid masses may irritate the cornea resulting in clinical signs of discomfort. It may draw the attention of patients' owners resulting in more frequent presentation to the clinic and potentially they maybe more likely to consent to surgical excision. In



contrast, lower eyelid masses usually cause less obvious clinical signs and therefore our study population may be slightly biased.

The present study indicates that the upper lateral eyelid is the most common site for masses. This has not been reported before in the veterinary literature.

Meibomian epithelioma and adenoma represent 10% of all tumour submissions to the Comparative Ocular Pathology Laboratory of Wisconsin. However, there were no further analysis focused on the eyelid.<sup>10</sup> In a large study of 202 dogs, sebaceous tumours were the most frequently encountered eyelid tumours in dogs.<sup>1</sup> The result was similar to our study, where we found that meibomian epithelioma was the most common eyelid tumour, followed by meibomian adenoma and meibomian carcinoma.

Most eyelid masses were benign in this study (92.4%). This result was similar to the research of Roberts and others (1986) that showed the prevalence of benign eyelid tumours was 88% in 200 dogs.<sup>5</sup> According to previous literature and our study, the prognosis of eyelid mass was usually excellent.

As eyelid masses were usually small and around the eyes, fine-needle aspiration cytology was not suitable to obtain a preliminary diagnosis. Surgical intervention with full-thickness excision and followed by histopathological examination were recommended. Up to one-third of the length of eyelid can be removed and closed with a wedge resection.<sup>9</sup> Surgical reconstruction is uncommonly performed in veterinary ophthalmology expect for larger lesions (masses longer than one-third of the total eyelid length).<sup>9,11</sup> Cryosurgery and laser ablation can be used alone or in combination with surgical debulking of eyelid tumours.<sup>3</sup> Eyelid tumours in this study were not a life-threatening disease; however, early recognition and appropriate surgical intervention are recommended to prevent further ocular irritation, cosmetic or functional impairment. Metastasis of eyelid tumours are uncommonly reported in veterinary studies.<sup>1</sup> The prognosis after surgical excision is usually good to excellent without unexpected complications.

The location of the eyelid masses of the canine patients in this study may reflect the likelihood of causing clinical signs by eyelid masses to draw owners' attention and seek medical management.

This study had some limitations. The volume of mass size maybe an over-estimation because we used the longest

diameter in length, width and height for measuring the size. The other possible reason was that we measured the mass size after surgical excision which would lead tissue to retract. The breed, sex and neuter status of the dogs with eyelid mass were not compared with the whole population in our hospital. This retrospective study was based on the information contained in medical records and pathology reports and the occurrence of some incomplete records may have influenced the results.

**Acknowledgements** We thank the assistance of Ju-Yun Cheng and Wei-Hsuan Chien for collecting patient data.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available upon request.

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