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Association between signalment and clinical signs, and nasal and nasopharyngeal diseases type and localization in dogs and cats

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Abstract

Background: **Upper respiratory tract diseases in companion animals encompass various diagnoses and anatomical localizations that are challenging to distinguish based solely on clinical signs.**

Hypothesis/Objectives: **Assess associations between signalment and clinical signs, and the localization and categories of nasal and nasopharyngeal diseases in dogs and cats.**

Animals: **A total of 396 client-owned animals (167 cats, 229 dogs) presented for nasal or nasopharyngeal disease at the Veterinary Teaching Hospital of the University of Liège (Belgium) between 2018 and 2022.**

Methods: **Retrospective observational cross-sectional study. Univariate and multivariate logistic regressions were used to identify associations between signalment and clinical signs and disease type or localization.**

Results: **Nasopharyngeal disease in cats was associated with stertor (odds ratio [OR], 10.1; 95%CI, 2.2-47.3; $P = .003$), dyspnea (OR, 6.5; 95%CI, 2.0-21.6; $P = .002$), absence of sneezing (OR, 0.1; 95%CI, 0.03-0.4; $P < 0.001$), and nasal discharge (OR, 0.04; 95%CI, 0.007-0.2; $P < .001$). In dogs, nasal and nasopharyngeal localizations were, respectively, associated with sneezing (OR, 95.6; 95%CI, 9.3-987.9; $P < .001$) and reverse sneezing (OR, 5.7; 95%CI, 1.3-25.2; $P = .02$). Although epistaxis was associated with both fungal rhinitis and nasal masses in dogs, only masses were associated with decreased nasal airflow (OR, 29.4; 95%CI, 8.1-106.9; $P < .001$), whereas it was preserved in fungal rhinitis (OR, 0.02; 95%CI, 0.003-0.15; $P < .001$). Systemic signs were observed in cats with nasal masses (OR, 7.3; 95%CI, 2.5-21.3; $P < .001$); in dogs, they were linked to fungal rhinosinusitis (OR, 26.1; 95%CI, 3.9-176.0; $P < .001$).**

Conclusions and clinical importance: **Signalment and clinical signs provide valuable indicators for diagnosis and localization of nasal diseases in dogs and cats, which may guide clinical decision-making.**

Keywords canine, diagnosis, feline, nose, nasopharynx, semiology

Abbreviations HRCT, high-resolution computed tomography; OR, odds ratio

Introduction

Nasal and nasopharyngeal diseases in dogs and cats encompass a wide spectrum of conditions, including inflammatory, infectious, and neoplastic disorders.[1,2] Common clinical signs include sneezing, nasal discharge, epistaxis, stertor, reverse sneezing, halitosis, open-mouth breathing, facial deformity, facial pain, nasal planum depigmentation, and exophthalmos.[1-11] In dogs, nasal diseases are most often caused by neoplasia, idiopathic chronic rhinitis (lymphoplasmacytic rhinitis), fungal rhinosinusitis, foreign bodies and oronasal defects, or periodontal diseases.[1,3-5,8,9,12] Aerodigestive disorders are also increasingly recognized contributors to nasal and nasopharyngeal diseases in dogs.[13,14] In cats, infectious diseases are a major differential diagnosis in acute diseases, whereas chronic rhinitis and neoplasia are most frequent in cats with chronic disease.[2,15-17] Nasopharyngeal stenosis and polyps are well-documented in cats,[11,18-23] whereas nasopharyngeal diseases are less common in dogs.[24-26]

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Definitive diagnosis of nasal and nasopharyngeal diseases often requires general anesthesia to perform advanced diagnostic procedures including high-resolution computed tomography (HRCT), rhinoscopy, and biopsy.[1,7,27,28] However, these procedures are not always feasible in general practice because of limited availability, anesthetic risks, or financial constraints of the owners. Prompt and accurate localization and diagnosis are essential for prognosis and effective treatment, especially in progressive and potentially life-threatening diseases such as fungal rhinosinusitis and neoplasia.[1,27,29] Accordingly, large-scale studies of respiratory clinical signs are needed to aid clinicians in accurate disease localization and prioritization of differential diagnoses.

Our primary aim was to investigate the associations between signalment, clinical signs, and physical examination findings with the type and localization of nasal and nasopharyngeal diseases in dogs and cats.

Materials and methods

Animals and study design

Ours was a retrospective, cross-sectional, observational study. Medical records of dogs and cats examined at the Small Animal Veterinary Teaching Hospital of the University of Liège (Belgium) for suspected nasal or nasopharyngeal disease between January 2018 and December 2022 were retrospectively reviewed. The retrospective case search was conducted by reviewing the endoscopy logbooks, in which all patients that have undergone endoscopic procedures are manually recorded. Cases were included if they underwent both anterograde rhinoscopy and retrograde nasopharyngoscopy allowing thorough evaluation of the nasopharynx and nasal cavities, and received a definitive or presumptive diagnosis by a board-certified specialist in internal medicine with expertise in respiratory medicine. The HRCT of the head often was performed as part of the diagnostic evaluation but was not required for inclusion, as was other specific respiratory testing. Exclusion criteria were incomplete medical records, findings consistent with concurrent lower airway disease or any other unrelated systemic disease that could have contributed to the investigated clinical signs.

Signalment information, history, clinical signs, and physical examination findings were extracted from the medical records. The demographic data included age, sex, neuter status, and breed. Dogs were further categorized by skull conformation as brachycephalic, mesocephalic, or dolichocephalic. A predefined list of clinical signs and physical examination findings (Table 1) was used to classify each as either present or absent based on medical records. For cases presented with nasal discharge, the discharge characteristics (serous [watery], mucous [whitish-opaque], and mucopurulent [yellow green]) and its lateralization (unilateral or bilateral) were documented. The duration of clinical signs before presentation was noted and classified as acute ($<$1 month) or chronic ($\geq$1 month).

Diagnosis and localization

Diagnoses were established based on findings from anterograde rhinoscopy and retrograde nasopharyngoscopy in all cases, combined with some combination of imaging, histopathology, cytology, and infectious agents screening results when available.

Table 1 Signalment characteristics and clinical signs recorded in dogs and cats.

Signalment characteristics	Clinical signs (present/absent)
Breed	Sneezing
Sex (FE, FN, ME, MN)	Reverse sneezing
Age (years)	Nasal discharge[a]
Weight (kg)	Epiphora
Clinical signs duration (months)	Epistaxis
	Stertor
	Stridor
	Retching
	Gagging
	Dysphagia
	Decreased nasal airflow
	Nasal planum depigmentation
	Nose hyperkeratosis
	Exophthalmia
	Facial deformity
	Facial pain
	Cough
	Dyspnea/open-mouth breathing
	Systemic signs (lethargy, anorexia, weight loss)

Abbreviations: FE = female intact; FN = female spayed; ME = male intact; MN = male neutered. [a]If present, this clinical sign was further categorized as unilateral or bilateral.

The decision to perform these specific ancillary investigations was not standardized and was based on the internal medicine board-certified specialist's assessment of each case. In cats, diagnoses were categorized as nonspecific rhinitis (including presumed bacterial, viral, or idiopathic rhinitis), fungal rhinitis, dental disease, nasal mass, foreign body, nasopharyngeal stenosis, or nasopharyngeal polyp. For dogs, diagnostic categories included chronic inflammatory rhinitis, fungal rhinitis, nasal mass, foreign body, and dental disease.

Diagnoses were considered definitive when direct visualization of the underlying lesion was possible during rhinoscopy, or during HRCT if available. These included foreign bodies, masses, fungal rhinosinusitis (presence of characteristic fungal plaques), dental disease (oronasal fistulae or dental abscessation directly identified), and in cats nasopharyngeal polyps or nasopharyngeal stenosis. Regarding chronic inflammatory rhinitis, the diagnosis was considered presumptive in the absence of HRCT images, when based solely on compatible clinical presentation, compatible rhinoscopic findings and histopathologic findings when available.

Disease localization was classified into 3 groups: diseases of the nasal cavity (with or without sinus involvement), diseases of the nasopharynx, and diseases affecting both the nasal cavity and the nasopharynx (ie, involving the choanae).

Statistical analysis

Statistical analyses were performed using commercially available software (SAS Version 9.4 for Windows [SAS Institute, Cary, North Carolina, USA]; R version 4.3.1 for Windows [R foundation for Statistical Computing, Vienna, Austria]). Normal distribution of continuous variables was evaluated using the Shapiro–Wilk

test. Continuous variables were reported as median and range. Qualitative variables were reported as number and percentage.

The study cat and dog populations were analyzed separately because of species-specific characteristics and differences in the prevalence of nasal diseases and localizations.

Characteristics were compared across diagnostic and localization categories using the Student's *t*-test or Kruskal–Wallis test for quantitative variables and the chi-squared test for qualitative variables. Separate univariate logistic regression models were used to evaluate the association between each clinical variable and either diagnostic group or anatomical localization. Univariate analyses were used to estimate crude odds ratios (ORs) and 95%CIs. Variables with a $P < .1$ in the univariate logistic regression models were selected for the multivariate logistic regression models and reported as adjusted ORs (95%CIs) and *P*-values. In cases where standard logistic regression was not appropriate because of small sample sizes or rare outcomes, Firth's correction was applied to decrease bias. Missing data were not replaced, and calculations were done on the maximum data available. Statistical significance was set at $P < .05$.

Using principal component analysis, the relationships between clinical characteristics and their contribution to differentiating between all diagnoses and localizations in each species were visualized using a biplot—a graphical representation of p-dimensional data in 2 dimensions. A biplot only explains a certain percentage of the variance of this p-dimensional data structure and is only an approximation. In these plots, the length of an arrow represents the relative importance of a variable, with arrows pointing in the same direction indicating a positive association, opposite directions indicating negative associations, and orthogonal angles suggesting no association.

Results

Study population

Baseline characteristics

A total of 396 animals were included in this study, comprising 167 cats and 229 dogs. The signalment characteristics of all included animals are detailed in Table 2. Most cats were domestic shorthairs (*n* = 114, 68.3%), Maine Coon (*n* = 11, 6.6%), and British Shorthair (*n* = 9, 5.4%). The other represented breeds among cats are detailed in Table SS1. Regarding dogs, the most represented breeds were crossbreed (*n* = 41, 17.90%), Border Collie (*n* = 16, 6.99%), Golden Retriever (*n* = 15, 6.55%), and Jack Russell Terrier (*n* = 13, 5.68%). The remainder of represented breeds are detailed in Table SS2. Skull conformation was available in 188 dogs; 37 dogs were brachycephalic (19.7%), 132 were mesocephalic (70.2%), and 19 were dolichocephalic (10.1%).

Table 2 Signalment characteristics of dogs (*n* = 229) and cats (*n* = 167) included in the study.

	Dogs	Cats
Variables	**Median (range)**	
Age (years)	7.6 (0.2-16.1)	8.1 (0.2-19.6)
Body weight (kg)	18.2 (1.8-69.5)	4.0 (1.0-10.0)
Variables	**Number (%)**	
Sex		
• Intact male	67 (29.3)	11 (6.6)
• Neutered male	68 (29.7)	83 (49.7)
• Intact female	21 (9.2)	7 (4.2)
• Spayed female	73 (31.9)	66 (39.5)
Breed		
• Pedigree	188 (82.1)	53 (31.7)
• Non-pedigree	41 (17.9)	114 (68.3)

Table 3 Frequency of the clinical signs observed in dogs (*n* = 229) and cats (*n* = 167) included in the study.

	Dogs	Cats
Clinical signs	**Number (%)**	**Number (%)**
Sneezing	204 (89.1)	115 (68.9)
Reverse sneezing	71 (31.0)	10 (6.0)
Nasal discharge	171 (74.7)	117 (70.1)
Epiphora	9 (3.9)	35 (21.0)
Epistaxis	95 (41.5)	25 (15.0)
Stertor	26 (11.4)	100 (59.9)
Stridor	4 (1.7)	8 (4.8)
Retching	11 (4.8)	3 (1.8)
Gagging	4 (1.7)	10 (6.0)
Dysphagia	4 (1.7)	20 (12.0)
Decreased nasal airflow	44 (19.2)	118 (70.7)
Nasal planum depigmentation	39 (17.0)	0
Nose hyperkeratosis	29 (12.7)	0
Exophthalmia	2 (0.9)	8 (4.8)
Facial deformity	6 (2.6)	13 (7.8)
Facial pain	15 (6.6)	7 (4.2)
Cough	14 (6.1)	8 (4.8)
Dyspnea/open-mouth breathing	6 (2.6)	47 (28.1)
Systemic signs	44 (19.2)	42 (25.1)

Clinical signs

In cats, the median duration of clinical signs before presentation was 4.6 months (range, 0.0-96.6), with 136 (81.4%) cats presenting with chronic disease and 31 (18.6%) with acute disease. The median duration of clinical signs in dogs was 2.0 months (range, 0.0-36.0), with 154 (67.2%) dogs presenting with chronic disease and 75 (32.8%) with acute disease. Clinical signs observed in dogs and cats are presented in Tables 3 and 4.

Diagnoses and localizations

Table 5 provides a summary of ancillary testing stratified by diagnostic categories across both species.

Nonspecific rhinitis was diagnosed in 67 (40.1%) cats, with compatible nasal histopathologic results available in 45 (67.2%) cats. Viral testing for both feline herpesvirus and calicivirus were performed in 20 (29.9%) cats by quantitative PCR on nasal swabs, with 1 cat positive for herpesvirus and 1 positive for calicivirus.

Table 4 Characteristics of the nasal discharge observed in dogs (*n* = 171) and cats (*n* = 119).

Variables	Subcategories	Number (%)	
		Dogs	Cats
Discharge lateralization	Unilateral	102 (59.6)	42 (35.3)
	Bilateral	69 (60.4)	77 (64.7)
Type of discharge	Serous	48 (28.1)	12 (10.1)
	Seromucous or mucous	36 (21.0)	26 (21.8)
	Mucopurulent or purulent	87 (50.9)	81 (68.1)

Table 5 Imaging and histopathological testing performed in addition to anterograde rhinoscopy and retrograde nasopharyngoscopy, stratified by diagnostic categories in dogs (*n* = 229) and cats (*n* = 167).

Diagnostic categories	Total number of cases		Head HRCT alone *Number* (%)		Histopathology from nasal biopsy sample alone *Number* (%)		Head HRCT combined with histopathology *Number* (%)	
	Dog	Cat	Dog	Cat	Dog	Cat	Dog	Cat
Chronic nonspecific rhinitis	61	67	3 (4.9)	4 (6.0)	18 (29.5)	28 (41.8)	20 (32.8)	17 (25.4)
Fungal rhinitis	70	6	33 (47.1)	0	0	0	4 (5.7)	4 (66.7)
Foreign body	59	6	0	0	1 (1.7)	1 (16.7)	0	0
Dental disease	11	3	6 (54.5)	2 (66.7)	1 (9.1)	0		0
Mass	28	38	2 (7.1)	2 (5.3)	13 (46.4)	19 (50)	7 (25.0)	8 (21.0)
Nasopharyngeal stenosis	0	31	0	7 (22.6)	0	0	0	0
Nasopharyngeal polyp	0	16	0	4 (25.0)	0	2 (12.5)	0	4 (25.0)
Total	229	167	75 (32.8)	50 (29.9)	64 (27.9)	82 (49.1)	31 (13.5)	33 (19.8)

Abbreviation: HRCT = high-resolution computed tomography.

Bacterial culture on nasal swab was performed in 11 (16.4%) cats and positive in 4 cats. Other microbial testing on nasal swabs included quantitative PCR for *Mycoplasma felis* in 9 (13.4%) cats (positive in 4/9 cats) and PCR for *Bordetella bronchiseptica* in 6 (9.0%) cats (all negative). Cats with positive results for infectious agents were analyzed together with cats in which infectious testing was negative or not performed, within the broader category of chronic nonspecific rhinitis.

Other diagnoses in cats included mass (*n* = 38, 22.8%), nasopharyngeal stenosis (*n* = 31, 18.6%), nasopharyngeal polyp (*n* = 16, 9.6%), foreign body (*n* = 6, 3.6%), fungal rhinitis (*n* = 6, 3.6%), and dental disease (*n* = 3, 1.8%). Among the 38 cats diagnosed with a nasal mass, a definitive tumor diagnosis was obtained by histopathology in 27 cats (71.1%) and by cytology in 4 cats (10.5%). Tumor types identified included lymphoma (*n* = 20, 64.5%), adenocarcinoma (*n* = 10, 32.2%), and sarcoma (*n* = 1, 3.2%). In the remaining 7 cats (18.4%), the exact nature of the mass could not be determined. In 6 of these cats, cytology identified malignant cells but was insufficient to further classify the neoplasm, and in 1 cat no sampling was performed, and the presumptive diagnosis of neoplasia was based on imaging findings. Regarding disease localization, 82 (49.1%) cats had nasal disease, 61 (36.5%) cats had nasopharyngeal disease, and 24 (14.4%) had involvement of both the nasopharynx and nasal cavities.

In dogs, the most common diagnosis was fungal rhinitis (*n* = 70, 30.6%), followed by chronic nonspecific rhinitis (*n* = 61, 26.6%), foreign body (*n* = 59, 25.8%), mass (*n* = 28, 12.2%), and dental disease (*n* = 11, 4.8%). Among dogs with a mass, a definitive diagnosis was established by histopathology in 20 dogs (71.4%) and by cytology in 3 dogs (10.7%). Tumor types identified included carcinoma (*n* = 14, 60.9%), osteosarcoma (*n* = 4, 14.7%), chondrosarcoma (*n* = 4, 17.4%), and olfactory neuroblastoma (*n* = 1, 4.3%). In the remaining 5 dogs (17.9%), presumptive diagnosis of neoplasia was made based on the visualization of extensive masses on head HRCT (*n* = 2) or rhinoscopy (*n* = 3). The disease was confined to the nasal or sino-nasal cavities in 184 (80.3%) dogs, to the nasopharynx in 21 (9.2%) dogs and involved both the nose and nasopharynx in 24 (10.5%) dogs.

Association between signalment and clinical signs and disease localization

The results of the univariate logistic regression analysis are detailed in Tables SS3 and SS4. The results of multivariate logistic regression models for the studied variables and disease localization in dogs and cats are shown in Table 6.

Table 6 Multivariate logistic regression analysis of clinical signs potentially associated with disease localization in dogs (*n* = 229) and cats (*n* = 167).

	Nasal disease				Nasopharyngeal disease				Nasal and nasopharyngeal disease			
	Dogs		Cats		Dogs		Cats		Dogs		Cats	
Variables	**Adjusted OR (95%CI)**	***P***	**Adjusted OR (95%CI)**	***P***	**Adjusted OR (95%CI)**	***P***	**Adjusted OR (95%CI)**	***P***	**Adjusted OR (95%CI)**	***P***	**Adjusted OR (95%CI)**	***P***
Epistaxis	*NA*	*NA*	14.10 (2.80-70.92)	.0013	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Decreased nasal airflow	*NA*	*NA*	*NA*	*NA*	5.73 (1.41-23.34)	.015	*NA*	*NA*	6.67 (2.47-18.01)	.0002	*NA*	*NA*
Dysphagia	*NA*	*NA*	0.033 (0.002-0.58)	.020	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Open-mouth breathing	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	6.52 (1.96-21.63)	.0022	*NA*	*NA*	*NA*	*NA*
Nasal discharge	*NA*	*NA*	21.70 (3.01-152.49)	.0003	*NA*	*NA*	0.04 (0.01-0.25)	.0006	*NA*	*NA*	*NA*	*NA*
Reverse sneezing	0.06 (0.01-0.31)	.0009	*NA*	*NA*	5.67 (1.28-25.17)	.022	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Sneezing	95.61 (9.3-297.9)	.0001	10.40 (1.54-70.38)	.016	0.068 (0.02-0.34)	.0015	0.11 (0.03-0.40)	.0008	*NA*	*NA*	4.12 (1.25-13.3)	.018
Stertor	0.026 (0.004-0.19)	.0003	0.014 (0.002-0.075)	<.0001	*NA*	*NA*	10.10 (2.16-47.31)	.0033	3.81 (1.29-11.25)	.0016	7.89 (2.14-29.14)	.0019

Abbreviations: OR = odds ratio; NA = not applicable.

Association between signalment and clinical signs and diagnosis

Cats

At a univariate level, several clinical variables (history and physical examination findings) showed associations with specific diagnoses in cats (Table SS5). However, the multivariate analysis identified significant associations only for chronic rhinitis, nasal masses, and nasopharyngeal stenoses. No significant associations were found for fungal rhinitis, dental disease, nasopharyngeal polyps or foreign bodies. The significant results retained in the multivariate models are presented in Table 7.

Dogs

Results of the univariate analysis are available in Table SS6. The multivariate models identified significant associations between clinical variables and each specific diagnosis; the results are presented in Table 8.

Biplots

For cats, in the biplot representing the relationships among clinical characteristics, diagnoses, and localizations, the first axis primarily separated nonspecific rhinitis from other conditions, with strong associations with the presence of nasal discharge and sneezing. The second axis distinguished nasopharyngeal stenosis and nasopharyngeal polyps, which clustered separately because of the presence of stertor and the absence of sneezing (Figure 1).

For dogs, the first axis was mainly associated with systemic signs, facial deformity, and decreased nasal airflow, effectively separating masses from chronic nonspecific rhinitis and fungal rhinitis. The second axis highlighted acute clinical signs, reverse sneezing, and unilateral nasal discharge as key features of nasal foreign body cases (Figure 2).

Discussion

Our study provides insight into the clinical presentation of nasal and nasopharyngeal diseases in dogs and cats. Analysis of a large cohort of dogs and cats identified key clinical signs associated with disease localization and specific diagnoses, with presence of species-specific characteristics. It also highlighted that the absence of some clinical signs can be as important as their presence to distinguish diseases. Nasopharyngeal disease showed a unique clinical pattern in cats. Distinct clinical profiles emerged for fungal rhinitis, masses, and chronic rhinitis in dogs, offering improved diagnostic guidance.

Regarding localization, nasopharyngeal diseases were diagnosed in a third of the cats. Such localization in cats was strongly associated with the presence of stertor and open-mouth breathing, and absence of concurrent sneezing or nasal discharge. No significant association was found with the presence of reverse sneezing. These findings align with previous studies, confirming the characteristic clinical presentation of nasopharyngeal obstruction.[11,18-20] Strictly nasopharyngeal diseases were less frequent in dogs and associated with the presence of reverse sneezing, decreased nasal airflow and the absence of sneezing. These results are consistent with previous observations,[30] because reverse sneezing is a mechanosensitive aspiration reflex triggered by nasopharyngeal irritation. No significant association was found between nasopharyngeal disease in dogs and stertor, which contrasts with the findings in cats. Although type 2 statistical error cannot be excluded, this lack of association may be due to the fact that most cases in

Table 7 Multivariate logistic regression analysis of signalment and clinical signs potentially associated with specific diagnoses in cats (n = 167).

	Chronic rhinitis (n = 67)		Mass (n = 38)		Nasopharyngeal stenosis (n = 31)	
Variables	**Adjusted OR (95%CI)**	***P***	**Adjusted OR (95%CI)**	***P***	**Adjusted OR (95%CI)**	***P***
Bilateral nasal discharge	13.7 (4.4-42.5)	<.0001	*NA*	*NA*	*NA*	*NA*
Decreased nasal airflow	*NA*	*NA*	6.7 (1.2-35.6)	.03	*NA*	*NA*
Open-mouth breathing	0.2 (0.1-0.7)	.010	*NA*	*NA*	*NA*	*NA*
Facial deformity	*NA*	*NA*	23.5 (3.8-146.4)	.001	*NA*	*NA*
Age (years)	*NA*	*NA*	1.3 (1.1-1.4)	.0002	*NA*	*NA*
Sneezing	*NA*	*NA*	*NA*	*NA*	0.06 (0.02-0.2)	<.0001
Stertor	0.2 (0.1-0.5)	.001	3.6 (1.1-11.9)	.04	9.8 (2.0-47.3)	.005
Systemic signs	0.2 (0.1-0.5)	.001	7.3 (2.5-21.3)	.0003	*NA*	*NA*

Abbreviations: OR = odds ratio; NA = not applicable.

Table 8 Multivariate logistic regression analysis of signalment and clinical signs potentially associated with specific diagnoses in dogs (n = 188[a]).

	Chronic nonspecific rhinitis (n = 61)		Fungal rhinitis (n = 70)		Mass (n = 28)		Dental disease (n = 10)		Foreign body (n = 48)	
Variables	**Adjusted OR (95%CI)**	***P***	**Adjusted OR (95%CI)**	***P***	**Adjusted OR (95%CI)**	***P***	**Adjusted OR (95%CI)**	***P***	**Adjusted OR (95%CI)**	***P***
Skull (mesocephalic vs brachycephalic)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	0.1 (0.02-0.3)	.001
Chronic signs	*NA*	*NA*	52.1 (5.2-524.8)	.001	*NA*	*NA*	*NA*	*NA*	0.04 (0.01-0.2)	<.0001
Decreased nasal airflow	*NA*	*NA*	0.02 (0.003-0.2)	.0002	29.4 (8.1-106.9)	<.0001	*NA*	*NA*	*NA*	*NA*
Epistaxis	0.05 (0.02-0.2)	<.0001	37.0 (9.1-150.2)	<.0001	8.4 (2.1-34.4)	.003	*NA*	*NA*	*NA*	*NA*
Age (years)	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	1.2 (1.0-1.5)	.03	*NA*	*NA*
Nasal discharge	10.4 (3.5-30.9)	<.0001	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Nose discoloration	*NA*	*NA*	6.5 (1.5-28.6)	.013	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Systemic signs	*NA*	*NA*	26.1 (3.9-176.1)	.001	*NA*	*NA*	*NA*	*NA*	0.007 (<.001-0.12)	.001
Weight	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	0.9 (0.8-1.0)	.03	*NA*	*NA*

[a] The multivariate models were done on 188 observations as skull conformation was missing for 41 dogs. Abbreviations: OR = odds ratio; NA = not applicable.

dogs involved nasopharyngeal foreign bodies, whereas in cats, nasopharyngeal diseases tended to be more obstructive in nature, such as polyps or stenosis. In fact, nasopharyngeal lesions in dogs often result from the extension of nasal processes[31] through the choanae. In our study, diseases extending to both nasal cavities and nasopharynx in dogs were indeed associated with the presence of stertor and decreased nasal airflow. On the other hand, nasal localization was strongly associated with sneezing and the absence of stertor in both species, as reported in previous publications.[1-5,7,12,15] In cats, additional associations were found between nasal localization and the presence of nasal discharge and epistaxis.

Our study identified significant associations between clinical signs and specific diagnoses. In accordance with previous literature,[9,29,32,33] fungal rhinitis in dogs was associated with nasal depigmentation, epistaxis, chronicity, and the presence of systemic signs. Because neoplastic disease also was associated with the presence of epistaxis, our research highlights the critical diagnostic value of nasal patency to help differentiate fungal rhinosinusitis from a nasal mass. Decreased nasal airflow was strongly associated with the presence of a mass, whereas dogs with fungal rhinitis typically exhibited normal or even increased nasal patency, with a significant association between fungal rhinitis and the absence of airflow reduction. In cats, a mass

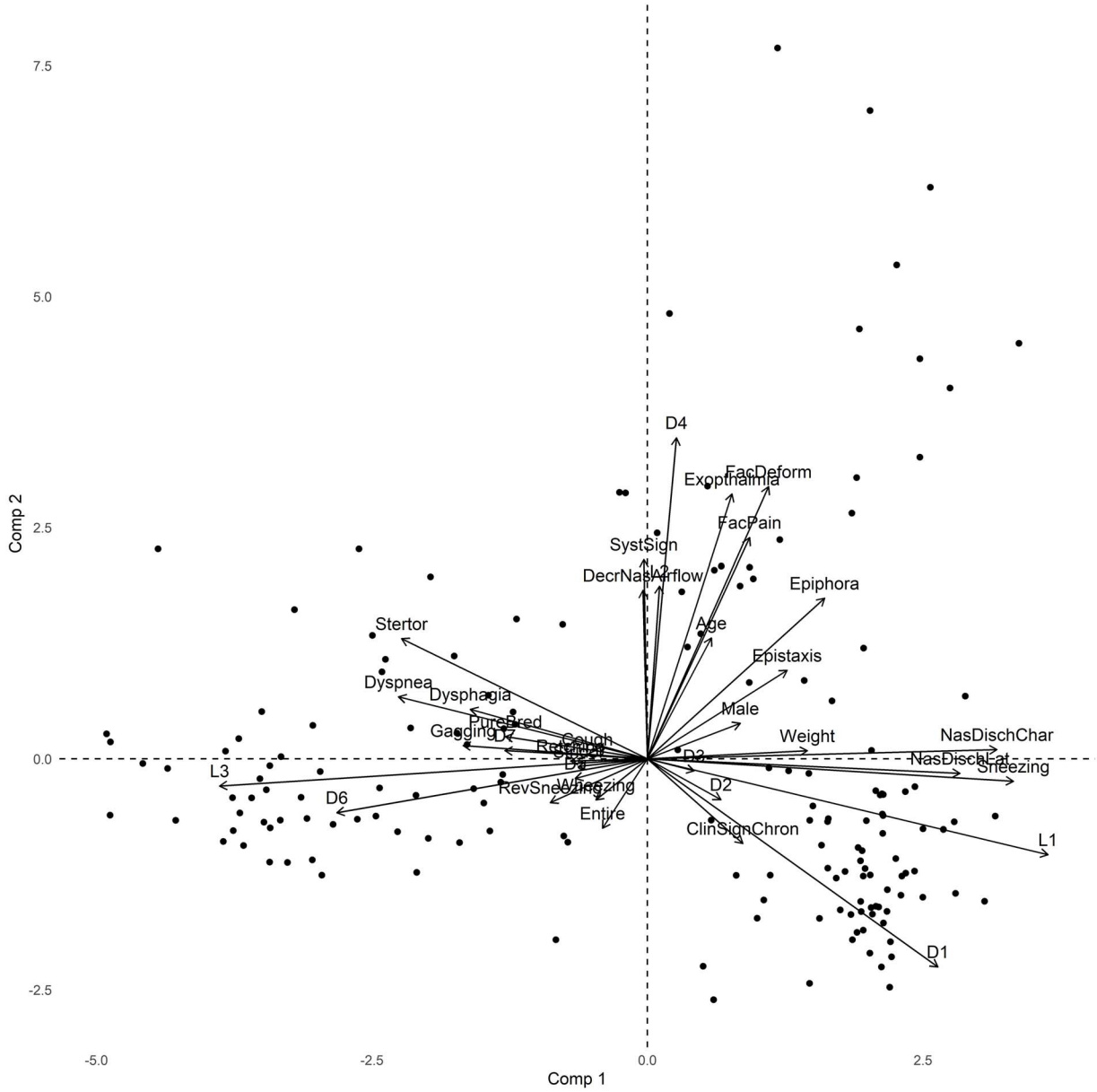

Figure 1 PCA biplot on clinical variables, diagnoses, and localization categories in cats (n = 167). The biplot displays the first 2 principal components (Comp1 and Comp2), which together explain 24.4% of the total variance. Each arrow represents a variable, with longer arrows indicating stronger contributions to the principal components. Variables pointing in the same direction are positively correlated, while those pointing in opposite directions are negatively correlated. Diagnoses and localizations are labeled categorically: L1, nasal localization; L2, nasal extending to nasopharynx; L3, nasopharyngeal localization; D1, nonspecific rhinitis; D2, fungal rhinitis; D3, tooth root disease; D4, mass; D5, foreign body; D6, nasopharyngeal stenosis; D7, nasopharyngeal polyp. Abbreviation: PCA = principle component analysis.

was associated with higher age, facial deformity, decreased nasal airflow, stertor, and the presence of systemic signs, in agreement with prior studies.[2,6,17] Lymphoma is the most common nasal cavity tumor reported in cats,[16,19,34] and the presence of systemic signs (anorexia, weight loss, and lethargy) may be related to the high prevalence of lymphoma in our study (ie, half of the cases with a mass). Possible explanations of systemic signs in cats with lymphoma include paraneoplastic syndrome or multiorgan involvement, which was described in 10/50 cats with nasal or nasopharyngeal lymphoma in one study.[17] However, that same study reported hyporexia in 60% (n = 30/50) of the cats, suggesting another cause for decreased appetite, possibly related to impaired olfaction by nasal obstruction. In both species, the presence of bilateral nasal discharge and sneezing without other clinical signs such as stertor, reverse sneezing or epistaxis, was suggestive of chronic rhinitis. Our study did not identify significant associations between nasal discharge characteristics (serous, mucous, and mucopurulent) and specific diagnoses, suggesting that these features may have limited discriminative value in clinical settings. However, this absence of significance does not rule out a potential diagnostic contribution, and subtle associations may emerge in larger or more targeted cohorts.[5,35,36]

Principal component analysis was used in our study as an exploratory statistical tool to visualize global patterns of

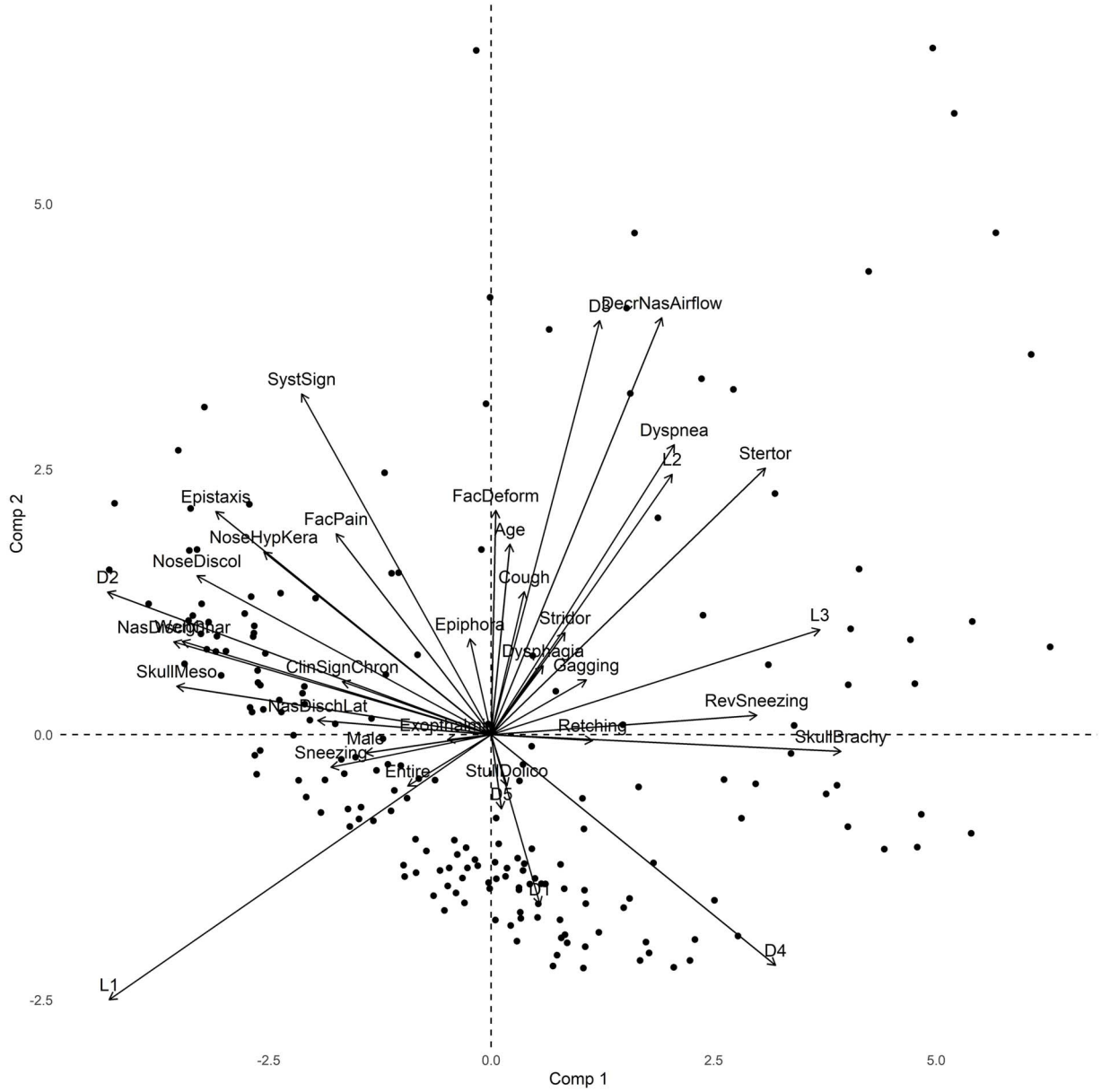

Figure 2 PCA biplot on clinical variables, diagnoses, and localization categories in dogs (n = 229). The biplot displays the first 2 principal components (Comp1 and Comp2), accounting for 23.8% of the total variance. Each arrow represents a variable, with longer arrows indicating greater contribution to the components. Variables pointing in the same direction are positively correlated, whereas opposing arrows indicate negative correlation. Diagnoses and localizations are labeled categorically: L1, nasal localization; L2, nasal extending to nasopharynx; L3, nasopharyngeal localization; D1, chronic nonspecific rhinitis; D2, fungal rhinitis; D3, mass; D4, foreign body; D5, tooth root disease. Abbreviation: PCA = principle component analysis.

association between clinical signs and diagnostic categories. In cats, biplots identified clear clinical clustering of nasopharyngeal conditions such as stenosis and polyps, characterized by a constellation of signs including stertor, open-mouth breathing, and absence of sneezing. Conversely, nonspecific rhinitis formed a distinct cluster associated with sneezing and bilateral nasal discharge, supporting its identification as a predominantly nasal process. In dogs, the biplots distinguished masses by their association with facial deformity and markedly decreased nasal airflow, which are consistent with invasive or space-occupying lesions. Fungal rhinosinusitis in dogs, although partially overlapping with neoplastic processes because of shared features such as epistaxis, remained distinct owing to preserved nasal airflow and a higher prevalence of nasal depigmentation. Importantly, these biplots also highlighted substantial overlap among conditions, particularly in dogs, reflecting the clinical complexity of upper respiratory diseases and their often-nonspecific presentation.[2-4,8,12,15]

Our study had some limitations, mainly owing to its retrospective design. Firstly, despite all cases having undergone both anterograde rhinoscopy and retrograde nasopharyngoscopy, the diagnostic evaluation was not standardized across cases, particularly regarding imaging modalities and histopathologic evaluation. As a result, some diagnoses were necessarily presumptive in a substantial number of cases. This factor may have led to some degree of etiologic misclassification, especially

regarding chronic nonspecific rhinitis, which ideally should be diagnosed by exclusion. Importantly, diagnoses, even when presumptive, were established by board-certified internists with extensive experience in respiratory medicine, based on an integrated assessment of clinical history and available ancillary testing. In cats, potential underlying infectious diseases such as feline herpesvirus or calicivirus were not systematically investigated. However, these conditions share similar clinical features with idiopathic chronic rhinitis, making clinical differentiation difficult, and their grouping under nonspecific rhinitis was considered appropriate for the objectives of our study. Fungal rhinosinusitis is a possible cause of chronic nasal disease in cats, and early cases may be underdiagnosed.[37,38] Although none of the cats included in the chronic nonspecific rhinitis category showed rhinoscopic or tomographic changes (when available) typically reported in fungal disease (eg, visible fungal plaques, marked turbinate destruction, osteolysis, exophthalmos, and facial deformity), subtle or early fungal infections may not always be easily identified, and misclassification cannot be completely excluded.

Regarding disease localization, all included animals underwent both anterograde rhinoscopy and retrograde nasopharyngoscopy, allowing a complete evaluation of the nasopharynx, choanae, and nasal cavities. Although the diagnostic yield of anterograde rhinoscopy can vary depending on patient size and clinician experience, these procedures were performed by experienced clinicians, making crucial localization errors unlikely. Moreover, the absence of nasopharyngeal and choanal abnormalities on retrograde nasopharyngoscopy confirmed a nasal localization. Sinus involvement may have been underdiagnosed in some animals without tomodensitometric evaluation, although this feature was not the primary focus of our study. Furthermore, the reliance on clinical records may have led to underreporting of certain clinical signs, physical examination findings, or comorbidities. Another constraint was the study's single-center setting, which probably influenced the prevalence of specific diseases and may limit generalizability to other geographic regions. The use of a referral population also inherently biases the study toward animals with more chronic or severe diseases. Finally, some diseases such as nasopharyngeal polyps and foreign bodies in cats or tooth root disease in both species were present in small numbers of animals, thus limiting statistical power.

In conclusion, our study emphasizes the importance of combining signalment, presence or absence of clinical signs, and physical examination findings as an initial framework for approaching nasal and nasopharyngeal diseases in small animals. Although definitive diagnosis ultimately relies on advanced imaging and histopathologic assessment, certain clinical features can meaningfully orient the clinician toward the most likely localization and diagnostic categories and help prioritize the most relevant complementary examinations, thus avoiding delays or ineffective empirical treatments. Future prospective multicenter studies using standardized diagnostic criteria would be valuable in further refining diagnostic algorithms.

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Author contributions

Mathilde Vilcot (Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Visualization, Writing—original draft, Writing—review & editing), Lara Ibrahim (Conceptualization, Data curation, Investigation, Methodology), Cecile Clercx (Supervision, Writing—original draft, Writing—review & editing), Elodie Roels (Conceptualization, Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing—original draft, Writing—review & editing), and Frédéric Billen (Conceptualization, Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing—original draft, Writing—review & editing)

Supplementary material

Supplementary material is available at *Journal of Veterinary Internal Medicine* online.

Conflicts of interest

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Off-label antimicrobial declaration

The authors declare no off-label use of antimicrobials.

Institutional animal care and use committee or other approval declaration

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The authors declare human ethics approval was not needed.

References

1. Cohn LA. Canine nasal disease: an update. *Vet Clin North Am Small Anim Pract*. 2020;50:359-374. https://doi.org/10.1016/j.cvsm.2019.11.002
2. Demko JL, Cohn LA. Chronic nasal discharge in cats: 75 cases (1993-2004). *J Am Vet Med Assoc*. 2007;230:1032-1037. https://doi.org/10.2460/javma.230.7.1032
3. Meler E, Dunn M, Lecuyer M. A retrospective study of canine persistent nasal disease: 80 cases (1998-2003). *Can Vet J*. 2008;49:71-76.

4. Lobetti RG. A retrospective study of chronic nasal disease in 75 dogs. *J S Afr Vet Assoc*. 2009;80:224-228. https://doi.org/10.4102/jsava.v80i4.212
5. Tasker S, Knottenbelt CM, Munro EA, Stonehewer J, Simpson JW, Mackin AJ. Aetiology and diagnosis of persistent nasal disease in the dog: a retrospective study of 42 cases. *J Small Anim Pract*. 1999;40:473-478. https://doi.org/10.1111/j.1748-5827.1999.tb02998.x
6. Malinowski C. Canine and feline nasal neoplasia. *Clin Tech Small Anim Pract*. 2006;21:89-94. https://doi.org/10.1053/j.ctsap.2005.12.016
7. Reed N. Chronic rhinitis in the cat: an update. *Vet Clin North Am Small Anim Pract*. 2020;50:311-329. https://doi.org/10.1016/j.cvsm.2019.10.005
8. Pietra M, Spinella G, Pasquali F, Romagnoli N, Bettini G, Spadari A. Clinical findings, rhinoscopy and histological evaluation of 54 dogs with chronic nasal disease. *J Vet Sci*. 2010;11:249-255. https://doi.org/10.4142/jvs.2010.11.3.249
9. Ostrzeszewicz M, Sapierzyński R. Fungal rhinitis in dogs. *Pol J Vet Sci*. 2015;18:683-688. https://doi.org/10.1515/pjvs-2015-0088
10. Malik R, Martin P, Wigney DI, et al. Nasopharyngeal cryptococcosis. *Aust Vet J*. 1997;75:483-488. https://doi.org/10.1111/j.1751-0813.1997.tb14377.x
11. Reed N, Gunn-Moore D. Nasopharyngeal disease in cats: 1. Diagnostic investigation. *J Feline Med Surg*. 2012;14:306-315. https://doi.org/10.1177/1098612X12444997
12. Windsor RC, Johnson LR, Herrgesell EJ, de Cock HEV. Idiopathic lymphoplasmacytic rhinitis in dogs: 37 cases (1997-2002). *J Am Vet Med Assoc*. 2004;224:1952-1957. https://doi.org/10.2460/javma.2004.224.1952
13. Grobman M, Reinero C. A One Health review of aerodigestive disease in dogs. *J Vet Intern Med*. 2023;37:817-834. https://doi.org/10.1111/jvim.16661
14. Gianella P, Roncone S, Ala U, et al. Upper digestive tract abnormalities in dogs with chronic idiopathic lymphoplasmacytic rhinitis. *J Vet Intern Med*. 2020;34:1845-1852. https://doi.org/10.1111/jvim.15827
15. Michiels L, Day MJ, Snaps F, Hansen P, Clercx C. A retrospective study of non-specific rhinitis in 22 cats and the value of nasal cytology and histopathology. *J Feline Med Surg*. 2003;5:279-285. https://doi.org/10.1016/S1098-612X(03)00044-5
16. Henderson SM, Bradley K, Day MJ, et al. Investigation of nasal disease in the cat—a retrospective study of 77 cases. *J Feline Med Surg*. 2004;6:245-257. https://doi.org/10.1016/j.jfms.2003.08.005
17. Little L, Patel R, Goldschmidt M. Nasal and nasopharyngeal lymphoma in cats: 50 cases (1989-2005). *Vet Pathol*. 2007;44:885-892. https://doi.org/10.1354/vp.44-6-885
18. Reed N, Gunn-Moore D. Nasopharyngeal disease in cats: 2. Specific conditions and their management. *J Feline Med Surg*. 2012;14:317-326. https://doi.org/10.1177/1098612X12444998
19. Allen HS, Broussard J, Noone K. Nasopharyngeal diseases in cats: a retrospective study of 53 cases (1991-1998). *J Am Anim Hosp Assoc*. 1999;35:457-461. https://doi.org/10.5326/15473317-35-6-457
20. Kudnig ST. Nasopharyngeal polyps in cats. *Clin Tech Small Anim Pract*. 2002;17:174-177. https://doi.org/10.1053/svms.2002.36602
21. Berent AC. Diagnosis and management of nasopharyngeal stenosis. *Vet Clin North Am Small Anim Pract*. 2016;46:677-689. https://doi.org/10.1016/j.cvsm.2016.01.005
22. Berent AC, Weisse C, Todd K, Rondeau MP, Reiter AM. Use of a balloon-expandable metallic stent for treatment of nasopharyngeal stenosis in dogs and cats: six cases (2005–2007). *J Am Vet Med Assoc*. 2008;233:1432-1440. https://doi.org/10.2460/javma.233.9.1432
23. Champetier A, Lemetayer J, Ruel Y, Dossin O. Nasopharyngeal stenosis in cats: a retrospective study of 21 cases comparing endoscopic and surgical treatment (2018–2022). *J Feline Med Surg*. 2024;26:1098612X241281902. https://doi.org/10.1177/1098612X241281902
24. Johnston G. Nasopharyngeal obstruction due to cystic Rathke's clefts in two dogs. *Aust Vet J*. 1999;77:94-96. https://doi.org/10.1111/j.1751-0813.1999.tb11675.x
25. Job C, Maitre P, Rivière D, Fine M, Faucher M. Nasopharyngeal presentation of a pharyngeal cleft cyst in a dog. *J Am Anim Hosp Assoc*. 2022;58:283-287. https://doi.org/10.5326/JAAHA-MS-7176
26. Burdick S, Berent AC, Weisse C, et al. Interventional treatment of benign nasopharyngeal stenosis and imperforate nasopharynx in dogs and cats: 46 cases (2005-2013). *J Am Vet Med Assoc*. 2018;253:1300-1308. https://doi.org/10.2460/javma.253.10.1300
27. Oechtering GU. Diseases of the nose, sinuses, and nasopharynx. In: Ettinger EJ, Feldman EC, Côté E, eds. *Textbook of Veterinary Internal Medicine: Diseases of the Dog and the Cat*. 9th ed. Elsevier; 2024:1128-1151.
28. Bouyssou S, Hammond GJ, Eivers C. Comparison of CT features of 79 cats with intranasal mass lesions. *J Feline Med Surg*. 2021;23:987-995. https://doi.org/10.1177/1098612X21994396
29. Sharman MJ, Mansfield CS. Sinonasal aspergillosis in dogs: a review. *J Small Anim Pract*. 2012;53:434-444. https://doi.org/10.1111/j.1748-5827.2012.01245.x
30. Talavera J, Sebastián P, Santarelli G, Barrales I, Fernández del Palacio MJ. Reverse sneezing in dogs: observational study in 30 cases. *Vet Sci*. 2022;9:665. https://doi.org/10.3390/vetsci9120665
31. Billen F, Day MJ, Clercx C. Diagnosis of pharyngeal disorders in dogs: a retrospective study of 67 cases. *J Small Anim Pract*. 2006;47:122-129. https://doi.org/10.1111/j.1748-5827.2006.00032.x
32. Peeters D, Clercx C. Update on canine sinonasal aspergillosis. *Vet Clin North Am Small Anim Pract*. 2007;37:901-916, vi. https://doi.org/10.1016/j.cvsm.2007.05.005
33. Prior C, Swales H, Sharman M, et al. Diagnostic findings in sinonasal aspergillosis in dogs in the United Kingdom: 475 cases (2011–2021). *J Small Anim Pract*. 2024;65:622-630. https://doi.org/10.1111/jsap.13736
34. Mukaratirwa S, van der Linde-Sipman J, Gruys E. Feline nasal and paranasal sinus tumors: clinicopathological study, histomorphological description and diagnostic immunohisto-

chemistry of 123 cases. *J Feline Med Surg*. 2001;3:235-245. https://doi.org/10.1053/jfms.2001.0141

35. Plickert HD, Tichy A, Hirt RA. Characteristics of canine nasal discharge related to intranasal diseases: a retrospective study of 105 cases. *J Small Anim Pract*. 2014;55:145-152. https://doi.org/10.1111/jsap.12175
36. Nakazawa Y, Ohshima T, Kanemoto H, Fujiwara-Igarashi A. Construction of diagnostic prediction model for canine nasal diseases using less invasive examinations without anesthesia. *J Vet Med Sci*. 2023;85:1083-1093. https://doi.org/10.1292/jvms.23-0315
37. Barrs VR, Halliday C, Martin P, et al. Sinonasal and sino-orbital aspergillosis in 23 cats: aetiology, clinicopathological features and treatment outcomes. *Vet J*. 2012;191:58-64. https://doi.org/10.1016/j.tvjl.2011.02.009
38. Russell OL, Johnson D, Allan F, et al. Fungal rhinosinusitis in cats in the United Kingdom: 34 cases (2013–2022). *J Vet Intern Med*. 2025;39:-e70076. https://doi.org/10.1111/jvim.70076

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