

Endoscopy and histopathology in the examination of the nasal cavity in dogs

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Abstract

Nasal diseases of chronic nature are a common clinical complaint in canine practice. However, precise diagnosis in these cases is often difficult and require the use of various, additional diagnostic methods. The aim of this study was to estimate the occurrence of diseases of the upper respiratory tracts in dogs, and to evaluate the usefulness of endoscopy in the diagnostic process as a method of obtaining a final diagnosis. In the group of dogs in which rhinoscopy was performed, the most common final diagnoses were nonspecific chronic rhinitis, followed by neoplasms and infectious rhinitis. It can be concluded that rhinoscopy should be considered mainly as a preliminary method of inspection of the nasal cavity, helpful in obtaining the most representative tissue specimen/specimens for histopathology. In some cases, especially foreign objects and congenital abnormalities rhinoscopy can give the possibility of obtaining a final diagnosis. However, even in these situations and also when any macroscopic lesion is found during endoscopy, microscopic examination of the mucosa specimen should be performed.

Key words: endoscopy, rhinoscopy, dog, histopathology

Introduction

Nasal diseases of chronic nature are a common clinical complaint in canine practice. However, precise diagnosis in these cases is often difficult and requires the use of additional diagnostic methods. Examination of the upper respiratory tract, as well as the trachea and bronchus usually requires a combination of several diagnostic techniques including rhinoscopy, bacteriology, mycology, cytology, histopathology and imaging techniques (radiography, computed tomography and others; Clercx et al. 1996, Willard 1999, Lefebvre et al. 2005, Petite and Dennis 2006, Meler et al. 2008). However, even where these additional

examinations are performed a definitive diagnosis can be difficult or impossible to establish in some cases (Bisset et al. 2007, Meler et al. 2008, Miles et al. 2008). The usefulness of endoscopic examination in diseases of the nasal cavity and upper respiratory tract in small animals is unarguable, especially in cases of nasal neoplasms, foreign objects, anatomical abnormalities and in some infections (Willard and Radlinsky 1999, Sapikowski 2006). Endoscopy allows direct inspection of the lumen and mucosal surfaces, to see abnormal growths and foreign objects; additionally, fluids as well tissue samples can be obtained during endoscopy from particular interesting macroscopic lesions. However, endoscopic diagnosis can be final

only in some cases and it must be confirmed by other diagnostic methods, especially histopathology and radiography (Petite and Dennis 2006, Sapikowski 2006).

The aim of this study was (1) to estimate the occurrence of different diseases of the nasal cavity in dogs, (2) to evaluate the usefulness of rhinoscopy in the diagnostic process, (3) to determine in which cases rhinoscopic diagnosis must be confirmed by other diagnostic tests, especially histopathology.

Materials and Methods

The study was performed on dogs submitted for consultation to the Small Animal Clinic of the Department of Clinical Sciences, Warsaw University of Life Sciences (SGGW) and in which endoscopic examination of the respiratory tract was performed in the period from January 2006 to December 2007. In the period analyzed 94 dogs were given on endoscopic examination of the upper respiratory tract as well as the trachea and bronchus. The mean age of dogs in which endoscopy was performed was 6.8 years, in dogs subjected to rhinoscopy it was 7.9 years (neoplastic 9.7; nonneoplastic 7.63), the animals in which laryngoscopy, tracheoscopy or bronchoscopy were performed were slightly younger (5.6 years). Rhinoscopy was performed in 46 dogs (44.6% of all dogs with respiratory tract endoscopy). All of them had previous problems with nasal discharge, sneezing or epistaxis. Before anesthesia venous blood was collected for complete blood count and measurement of the serum activities of serum alkaline phosphatase, alanine aminotransferase and the levels of urea nitrogen, creatinine, and glucose; cardiological examination and head radiographs were also performed. Dogs were anesthetized for endoscopic examination with a combination of atropine (0.02-0.04 mg/kg s.c.), medetomidine (0.02-0.08 mg/kg i.m.), midazolam (0.1 mg/kg i.m.) and butorphanol (0.1 mg/kg i.m.) for sedation and thiopental (5 mg/kg i.v.) for induction. The nasal cavity was examined using a 3.3-mm-diameter rigid endoscope type nopa XP 700/33 with fiber optic light source type BOB-OM (BOB Precoptic) in connection with a CMA-D2 (SONY) camera adaptor and camera control unit (SONY). Endoscopic findings were documented using a UP-2100P (SONY) color video printer. The appearance of turbinates and mucosa, and the presence of mass, foreign objects and discharge were estimated. The results of the endoscopic examination were defined as (a) final diagnosis, (b) presumptive diagnosis and other diagnostic tests suggested and (c) unknown. In some cases, during rhinoscopy, endoscopy-assisted mucosal biopsies of pathologic mucosa for histopathology using jaw pinch forceps with nonfenestrated 2.0-mm-diameter cups

were taken and submitted to the Division of Pathomorphology. Samples were fixed in 10% buffered formalin, dehydrated and embedded in paraffin. Paraffin blocks were cut into 4 µm sections, stained with hematoxylin and eosin and other histochemical methods where necessary. On the basis of microscopic examination, according to generally accepted histologic and cytologic criteria, a final histopathologic diagnosis was made. The results of endoscopic and histopathologic diagnosis were compared in these cases. The sex, age and breed of the animals, and the character and duration of clinical signs were recorded.

Results

Endoscopic diagnosis of nasal diseases was established in 41.3% of cases in which rhinoscopy was performed (in 21.7% of cases it was obtained by endoscopic examination alone and in 19.6% of cases it was confirmed by histopathology of tissue samples). In 50% of other cases diagnosis was considered presumptive and additional tests (microscopic examination of mucosal tissues) was recommended and performed, in 8.7% of dogs diagnosis was not established (unknown) during rhinoscopy (in all of these cases the mucosa was described as normal).

The endoscopic diagnoses obtained during rhinoscopy in the 46 dogs examined are listed in Table 1. In 30 cases when tissue specimens for histopathology were taken the most common endoscopic findings included: presence of tumor or mass (Fig. 1), turbinates or nasal septa deformation and/or destruction (46.6%), suspicion of rhinitis (26.6%), suspicion of fungal infection (10.2%; Fig. 2), normal (16.6%). In the remaining 16 cases, in which histopathology was not performed, endoscopic diagnosis included: normal (43.7%; including unknown), anatomical abnormalities (25%), tumor or masses (12.5%), purulent rhinitis (12.5%), and foreign body in one case (6.3%).

The most common histopathologic diagnosis was chronic lymphoplasmacytic rhinitis (50%), followed by neoplasms (23.3%; Fig. 3), purulent rhinitis (16.6%), mycotic infection (6.6%; Fig. 4) and dysplastic lesions in the nasal epithelium (3.3%). The lymphoplasmacytic rhinitis was characterized by moderate to severe infiltration by mature lymphocytes and plasma cells, blastic lymphocytes were present in a small amount, and in some cases various amounts of other types of leukocytes were present (mast cells, histiocytes, eosinophils and neutrophils). The mean age of dogs with rhinitis was 9.14 years (range 2.5 – 14.5). Clinically unilateral or bilateral nasal mucous or more common mucopurulent nasal discharge was present in dogs with lymphoplasmacytic rhinitis; epistaxis or nasal respiratory murmurs were noted more seldom. The most common endoscopic findings in these cases

Table 1. Endoscopic findings observed during rhinoscopy in 46 dogs.

Endoscopic diagnosis	All cases n = 46 (%)	Histopathology performed n = 30 (%)	Histopathology not performed n = 16 (%)
Tumor or mass, turbinates destruction and/or deformation	34.8	46.6	12.5
Rhinitis	21.8	26.6	12.5
Fungal infection	6.5	10.2	0.0
Anatomical abnormalities	8.7	0.0	25.0
Foreign body	2.1	0.0	6.3
Normal	17.4	16.6	18.5
Unknown (presumptive normal)	8.7	0.0	25.2

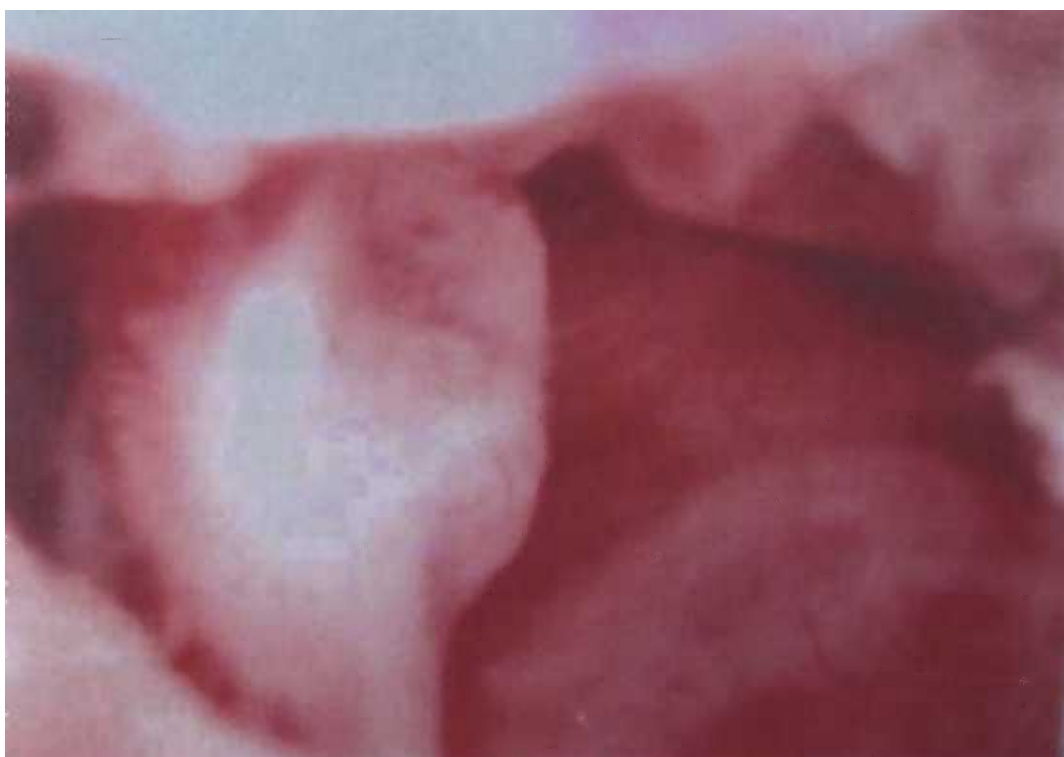


Fig. 1. Endoscopic view of nasal adenocarcinoma, note the tumor mass of neoplastic tissue within mucosa of the nasal septa.

Table 2. Signalement and type of nasal tumors recognized during endoscopy and/or histopathology (m – male; f – female).

Description of case	clinical signs	endoscopy findings/diagnosis	histopathologic diagnosis
f, 9 years, bobtail	nasal discharge	color changes of nasal mucosa	diffuse adenocarcinoma
f, 13 years, dachshund	mucous discharge	color changes of nasal mucosa	diffuse adenocarcinoma
m, 12 years, dachshund	mucopurulent discharge	neoplasm	adenocarcinoma
m, 10 years, poddle	epistaxis, palate deformity	plugging nodular deformation – tumor	undifferentiated carcinoma
f, 8 years, mix	epistaxis	destruction of nasal turbinates – tumor	adcnocarcinoma
f, 9 years, mix	epistaxis, purulent discharge	nodular deformity – tumor	adenocarcinoma, areas of necrosis
m, 7 years, mix	unilateral purulent discharge	nodular deformity of turbinates – tumor	adenocarcinoma



Fig. 2. Endoscopic view of nasal mycotic infection, note the characteristic growth of fungal hyphae on the turbinate surface.

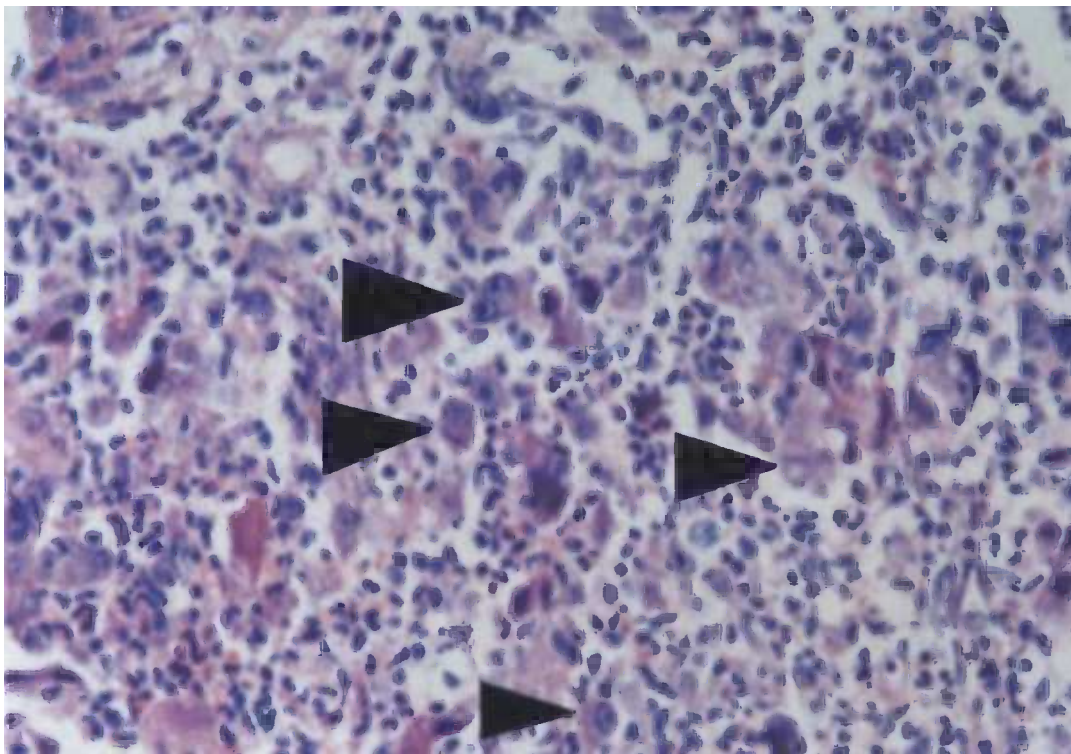


Fig. 3. Undifferentiated nasal adenocarcinoma – note neoplastic cells (arrowheads) scattered between inflammatory cells (hematoxyline-eosine stain, magnification 200x).

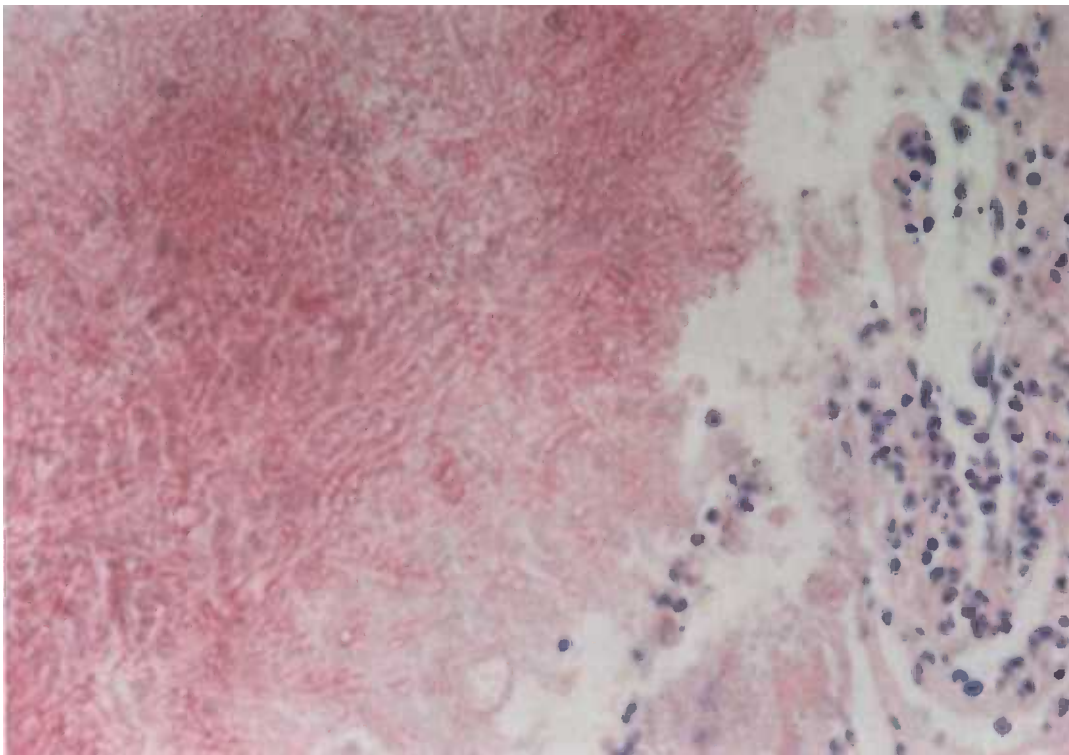


Fig 4. Mycotic rhinitis – note fungal hyphae (center and left) and granulocytic infiltration (right) (hematoksylina-eosine stain, magnification 200x).

were: presence of mucous secretion and edema of the mucosa (33.3%), deformity and narrowing of the nasal lumen (26.6%), atrophy of the turbinates (6.6%); in remaining 26.6% of cases no abnormalities were observed in the nasal cavities.

Neoplasms of the nasal cavity were recognized in 7 cases. The clinical signs, endoscopic findings and histologic tumor types are listed in Table 2. The mean age of dogs with tumors was 9.7 years (range 6 – 13 years). Samples for histopathology were taken in all cases when a neoplastic condition was suspected; however, results of histopathology and endoscopy in these cases were consistent in 5 of the 8 cases examined, in 3 other cases rhinitis chronica causing destruction and/or deformation of the turbinates or nasal septa were recognized (false positive). In addition, in two cases recognized endoscopically as only a mild change in mucosa colour, diffuse adenocarcinoma was recognized by histopathology (false negative). In both these cases chronic nasal discharge was observed clinically.

Purulent rhinitis, necrosis, and mycotic infection were observed in 26.6% dogs in which histopathologic examination was performed. The clinical presentation and endoscopic findings were the same in these cases. In all cases clinical signs included chronic, mucopurulent discharge with presence of fresh blood, and nasal stridor. During endoscopy the most consistent findings were presence of secretion, mild to severe edema of the nasal mucosa, deformity and destruction of the

turbinates, and more seldom, hyperplastic masses or white deposits on the mucosa were present.

Endoscopic examination of the larynx, trachea and bronchus was performed in 48 dogs. In the majority of cases indications for endoscopic examination were the presence of signs related to respiratory tract diseases, including cough (from transient to severe and chronic; 73% of cases), dyspnea, and voice change. The most common endoscopic diagnoses were inflammation or hyperemia of the laryngeal, tracheal or bronchial mucosa (32.6% of cases), tracheal collapse (32.6% of cases), followed by laryngeal paralysis (13.1% of cases), abnormalities of the soft palate (10.8 of% cases), neoplasms (4.3% of cases), and others. Tissue samples for histopathology were taken only in one case, to confirm the neoplastic nature of a growth observed during endoscopy (bronchial undifferentiated carcinoma).

Discussion

Diseases of respiratory tract are common observed in dogs and cats (Allen et al. 1999, Henderson et al. 2004, Demko and Cohn 2007, Meler and Lecuyer 2008). Infection and inflammation of the nasal cavity, larynx, and trachea are especially common in young cats. However, in these cases, apart from basic clinical examination, more advanced diagnostic methods are usually not made or needed. Dogs ac-

counted for more than 90% of patients requiring endoscopic examination of the respiratory tract in the period analyzed. Additionally, since final diagnoses confirmed by histopathology of tissue samples were most often obtained in dogs subjected to rhinoscopy, a detailed analysis only of these cases was made. In the present study it was shown that the mean age was different in dogs from groups in which other structures were examined endoscopically (rhinoscopy vs. tracheoscopy and laryngoscopy). It was not surprising that animals in which histopathology confirmed neoplastic tumor were older than dogs with nonneoplastic processes. Most cancers occur most often in older animals, with a mean age of 10-12 years, as in the present study (Bissett et al. 2007). Among nonneoplastic nasal diseases in the dogs examined a nonspecific or infectious inflammatory state was present most often and this was recognized in animals of various age, sometimes in young ones. Moreover, among dogs in which endoscopy of the pharynx, larynx or trachea was performed, congenital abnormalities, especially tracheal collapse and soft palate abnormalities in young animals, were commonly observed. For this reason the mean age of these dogs was lower than in the rhinoscopy group.

Among clinical signs in animals in this study unilateral or bilateral nasal discharge was observed. In most cases in dogs and cats with nasal or sinonasal disease a mucopurulent character of the exudative fluid is observed. However, the presence of fresh blood can also be noted, especially when destruction of nasal structures takes place (Lefebvre et al. 2005, Bissett et al. 2007). Epistaxis (nasal hemorrhage) is caused in most cases by local (nasal or paranasal) processes. However, it can also be due to systemic disease non-related to airways (Bissett et al. 2007). In cases of local nasal diseases, lesion extent (unilateral vs bilateral) was not significantly associated with final diagnosis in a study including 78 dogs examined by magnetic resonance images (Miles et al. 2008). Unfortunately, the presence of this clinical finding is not correlated with the character of the disease and should not be the basis of even on initial diagnosis (Bissett et al. 2007). As also described by others, in the present study chronic nasal discharge could be observed even in cases in which there was no macro- or microscopic changes in the nasal mucosa (Lefebvre et al. 2005).

The most common abnormalities observed during rhinoscopy in all the dogs examined in the present study were those related to chronic nonspecific rhinitis, followed by diseases connected with destruction of the nasal structures or the presence of tissue mass/masses. More seldom there were congenital abnormalities or the presence of foreign bodies. However, in some cases there were no clearly abnormalities in the region examined. Nonspecific rhinitis, following by nasal neoplasia are the most commonly rec-

ognized pathologies in dogs with chronic nasal diseases (Willard and Radlinsky 1999, Lefebvre et al. 2005, Meler et al. 2008). In the present study in most cases (58.7%) macroscopic examination of nasal mucosa did not allow a final diagnosis and tissue samples for histopathology were taken. However, in some (41.3% of cases) dogs diagnosis was established during rhinoscopy by macroscopic examination alone or confirmed by histopathologic examination. The tissue specimens were not usually sampled in cases when, during rhinoscopy, the presence of foreign bodies or congenital abnormalities were noted, or when nasal mucosa appeared normal. In the study of Lent and Hawkins (1992) final diagnosis obtained by rhinoscopy alone was established only in cases where foreign bodies or oronasal fistulas were present; moreover, in all 32 cases of rhinitis final diagnosis required histopathological examination of tissue samples. Additionally, as the present study shows even in cases where macroscopic changes are lacking or only subtle, histopathologic examination of tissue samples is required. In two cases, dogs in which histopathology revealed the presence of adenocarcinoma, only moderate discoloration of the mucosa without any hyperplastic or destructive lesions was observed during rhinoscopy. In another three dogs, in which the nasal mucosa was considered normal during endoscopic examination, a microscopic picture referable to lymphocyto-plasmacytic rhinitis chronica was seen.

As mentioned above, in many cases rhinoscopy does not make diagnosis easier, since the macroscopic picture of various nasal diseases is not specific, and the pathognomonic signs of specific abnormalities are usually absent. In one study final diagnosis could be obtained with rhinoscopy alone only in 8% of cases (Lent and Hawkins 1992). On the other hand, rhinoscopy makes direct and precise inspection of most surfaces of the nasal mucosa possible and more importantly the most representative tissue samples for cytology, histopathology and microbiology can be obtained.

The most common final diagnosis confirmed by histopathology was lymphoplasmacytic rhinitis or infectious rhinitis. In these cases additional laboratory tests, especially microbiology and mycology, were necessary to establish the etiologic agent or to rule out the infectious nature of the inflammatory process. In the present study various types of tumors within the nasal cavity were recognized in seven dogs, all of them were malignant and of epithelial origin. Neoplastic process is recognized in 15% – 45% of dogs examined by rhinoscopy. Nasal neoplasias have a chronic nature and this is usually connected with the presence of nasal tumor and/or destruction of nasal and paranasal structures (Willard and Radlinsky 1999, Lefebvre et al. 2005, Meler et al. 2008). However, in the present study in two cases of adenocarcinoma these endo-

scopic findings were subtle. Confirmation of neoplastic process requires histopathologic examination in every case, although cytopathology can be sufficient in some cases (Lent and Hawkins 1992, Sapikowski 2006, Miles et al. 2008). For example, in the present study in three cases when presence of the tumor was suspected during rhinoscopy, the histologic examination revealed lymphoplasmacytic or purulent rhinitis. Similarly, in another study, diagnosis of 35 canine nasal neoplasms was obtained only when rhinoscopy was connected with histopathologic examination of tissue biopsies (Lent and Hawkins 1992). There can be some difficulties in differentiation between inflammatory lymphocytic infiltrate with cases of well-differentiated small cell lymphoma, even during histopathologic examination of the tissue samples. In some of these difficult cases surgical biopsy of a larger tissue sample or samples is recommended to obtain the final diagnosis, or more advanced imaging techniques (computed tomography) should be used.

Collection of tissue samples during rhinoscopy and histopathological examination was performed most often in cases when destruction, deformity of turbinates or nasal septa were noted, presence of exophytic growth was observed, or the results of the endoscopic examination suggested mycotic infection. The precise diagnosis confirmed by histopathology in these cases enables more specific therapeutic modalities to be conducted, especially when very aggressive procedures are required (radical surgery, chemotherapy). Moreover, in some cases when euthanasia is considered the results of the microscopic examination of an adequate tissue specimen or specimens confirms the presumptive diagnosis and makes the decision easier for both the animal's owner and the physician. Agreement between the results of rhinoscopy and histopathology was obtained in 23.33% of cases. In a recent study conducted using magnetic resonance it was shown that presence of a mass was not specific for neoplasia, but absence of a mass effect was significantly associated with inflammatory infiltrate (Miles et al. 2008). However, presence of tissue mass was observed in all cases of nasal fungal rhinitis and in some cases of other inflammatory rhinitis, in combination with moderate to severe nasal turbinate destruction (Miles et al. 2008). The neoplastic process is often associated with inflammation, and histologic examination of only a small or superficial biopsy specimen means rhinoscopy may lead to a misdiagnosis of inflammatory disease (Willard and Radlinsky 1999, Miles et al. 2008). Additionally, a small mucosal specimen may mean that some infectious etiologic agent can be missed and nonspecific rhinitis instead of an infectious one is diagnosed (Willard and Radlinsky 1999).

On the basis of the present study it can be concluded that the nasal cavity of dogs can be affected by diseases of various kinds. Rhinoscopy should be considered mainly as a preliminary method of inspection of the nasal cavity and it is helpful in obtaining the most representative tissue specimen/specimens for histopathology. In some cases, especially foreign objects and congenital abnormalities, macroscopic inspection of the nasal cavities during rhinoscopy lead to final diagnosis. However, even in these situations, and also when any macroscopic lesions are found during endoscopy, microscopic examination of nasal mucosa specimens should be made.

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