Opis przypadku *Case report*

Application of rhinoscopy in the diagnostics of nasal tumors in dogs

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Summary

The aim of this article was to describe cases of nasal tumors in dogs in which a rhinoscopy procedure was used as part of the process of disease diagnosis. The study included two dogs, aged 8 and 11 years, showing symptoms of epistaxis. The animals underwent a radiological examination and a rhinoscopy, during which bioptats were taken for histopathological examination. The radiological examination of the head did not reveal lesions characteristic of a neoplastic process. The rhinoscopic examinations showed a large hyperplasia closing the nasal canal in both dogs. The histopathological examination of the two bioptats sampled from the nose area demonstrated clusters of cells characteristic of a neoplastic process. The dogs were euthanized and subjected to a post-mortem examination. The histopathological examination of samples taken from the lesions in the nasal cavity confirmed olfactory neuroblastoma and transitional cell carcinoma in dogs 1 and 2, respectively.

Rhinoscopy is a technique complementary to computer tomography, and, if the latter is impossible, it should represent, along with a radiological examination, the basis for a preliminary diagnosis of a neoplastic process, which ought to be confirmed by a cytological or histopathological examination of bioptats obtained from the sites of the lesions.

Keywords: dog, olfactory neuroblastoma, transitional cell carcinoma, rhinoscopy

Tumors of the nasal cavity and paranasal sinuses account for approximately 1% of all neoplasms in dogs (8). The average age of dogs with this disease is approximately 10 years. Medium and large breeds may be more commonly affected (15). Carcinomas, including adenocarcinomas, squamous cell carcinoma, and undifferentiated carcinoma, represent nearly two thirds of canine intranasal tumors (9). The existence of tumors in the nasal cavity is accompanied by unilateral (initially) epistaxis or bloody or mucopurulent discharge, sneezing, exophtalmus, and ocular discharge resulting from the mechanical obstruction of the nasolacrimal duct, as well as facial deformity due to bone erosion (9).

A definitive diagnosis of nasosinal cancer requires a tissue biopsy, even though diagnostic imaging and historical information can be highly suggestive (5).

The existence of a tumor in the nasal cavity can be indicated by a radiological examination or by computer tomography (CT). CT provides improved anatomical detail for accurate determination of the extent of the tumor and the location of abnormalities in the nasal cavity. The superior imaging value of CT over conventional radiographs for canine nasal disease, including neoplasia, is well documented (5, 14, 18).

Despite the inherent limitation of tissue superimposition, conventional radiography can still have a place in the diagnostic evaluation of dogs and cats suspected of having nasal tumors. In conventional radiography, such features as soft tissue opacities and the loss of turbinate detail that affect the entire ipsilateral nasal cavity, signs of invasion of the bones surrounding the nasal cavity, and soft tissue/fluid opacities within the ipsilateral frontal sinus have been correlated with a positive predictive value for neoplasia (16).

If the radiological examination does not indicate lesions characteristic of a neoplastic process in the nasal cavity and the sinuses, then, assuming no access

to CT, rhinoscopy becomes an alternative diagnostic method, which facilitates the demonstration of neoplastic lesions and makes it possible to take bioptats for histopathological examination (5, 7, 17).

The aim of the present article was to describe cases of nasal tumors in dogs, in which the rhinoscopy procedure was used as part of the diagnostic process.

Case descriptions

Case 1. A male dog, breed German Shepherd, aged 8 years, brought to the clinic for a prophylactic vaccination against rabies. The owners informed the doctor that for a certain period of time the dog had been snoring heavily and its sense of smell had deteriorated. They had also noticed that the dog would often change its position during sleep, sleeping with its neck stretched and its head laid on the right side. It had also been looking for secluded spots with steady access to fresh air. As the clinical examination did not reveal any abnormalities, and the hematologic test results remained within physiological norms, the owners were only advised to observe the animal. Three months later the dog was admitted to the clinic again, this time with slight bilateral epistaxis. It was explained that the animal had slid on the snow and hit its head against a wall. The bleeding was stopped using a cold compresses. Similar symptoms appeared a week later – the dog was then administered 500 mg of etamsylate intramuscularly (Cyclonamine, Galena Polska) and 1 mg of epinephrine (Adrenalini 0.1%, Polfa Warszawa Polska) intranasally in addition to cold compresses. Further bleeding began to occur every few days, another morphological blood test was then conducted, and blood coagulation parameters were determined, which did not show any deviations from physiological norms: antithrombin III (AT III) 126%; prothrombin time (PT) 9.4 s.; PT indicator 133%; INR 0.75; D-dimers 101 µg/l; fibrinogen 249 mg/dl; activated partial thromboplastin time (aPTT) 16.6s.; ratio aPTT 0.53. No genetic material of *Ehrlichia canis* or *Anaplasma phagocytophiulum* was detected in the patient's blood by means of a PCR test. The dog underwent a radiological head examination. The radiographs did not indicate lesions within the bone structure of the nasal cavity or the ethmoid bone. The treatment of 500 mg of etamsylate p.o. (Cyclonamine, Galena Polska) was continued.

Over the next two months, spontaneous epistaxis occurred in the dog three times (mainly from the right nostril), which is why the animal was referred for a rhinoscopy. Before the examination, a general morphological and biochemical blood test was conducted, which showed leucocytosis (35 × 10^9/l), slightly lowered hematocrit (34.7%), and a slightly raised urea level (47.9 mg/dl), the remaining parameters showing no deviations from the reference values. The procedure was carried out under full anesthesia by means of xilazine 3 mg/kg b.w. i.m. (Sedazin, Biowet Puławy Polska) and propofol 5 mg/kg b.w. i.v. (Scanofol, Scanvet; Polska). The examination revealed

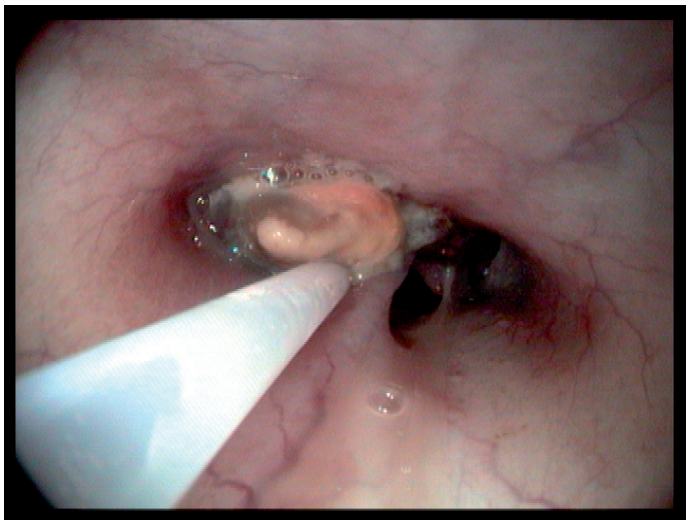

Fig. 1. Hyperplasia closing the lumen of the right nasal canal of the dog from case 1

a disturbed arrangement of the choanae – a large hyperplasia was found near the lumen of the right nasal canal (Fig. 1). The mucous membrane of the left nasal cavity was pink, and the nasal laminas were developed correctly. The right nasal cavity, with a softened hyperemic mucous membrane, was filled with a large amount of bloody-purulent secretion. The nasal laminas were pathologically changed and, in the posterior part, inaccessible for examination because of the hyperplasia narrowing the nasal cavity space and the presence of blood and pus, which could not be completely removed. A right nasal canal atresia was determined. The general picture of the lesions observed led to the suspicion of neoplastic hyperplasia.

During the rhinoscopic examination, material for bacteriological tests was taken along with bioptats from the changed sites for histopathological tests, which were fixed in 10% formalin. From the swabs taken from the nose,

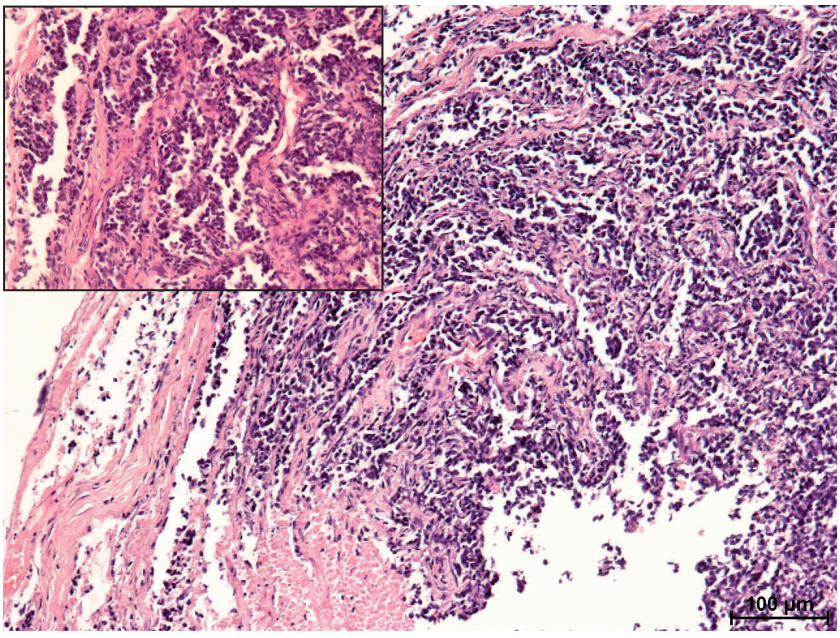

Fig. 2. A microscopic picture of the bioptat from the nasal mucosa – case 1. Infiltration of neoplastic cells under a necrotizing epithelium. Staining HE. Magn. approx. 100 ×. In the left upper corner: the picture of the neoplastic cells in a higher magnification (200 ×)

Bordetella bronchiseptica was isolated. The strain obtained proved to be sensitive in vitro to ceftiofur, marbofloxacin, and streptomycin, medium-sensitive to gentamicin, and resistant to oxytetracycline, lincomycin, penicillin, and cefoperazone. On the basis of the antibiogram results, the dog received marbofloxacin at a dose of 2 mg/kg body weight, p.o. (Marbocyl, Vetoquinol Polska). In supportive treatment, the following were used: Glucose 5% i.v. (40 ml/kg body weight, Baxter Polska), Duphalyte i.v. (10 ml/kg body weight, ScanVet Polska), Vitamin C 10% inj. i.v. (0.2 ml/kg body weight, Biowet Puławy; Polska), Combivit i.v. (10 ml, ScanVet Polska), Catosal 10% i.v. (5 ml, Bayer Animal Health GmbH; Polska), and Intravit B12 s.c. (1 ml, ScanVet Polska).

The histopathological examination of the bioptats taken showed, under a necrotizing epithelium, the presence of clusters of very small oval cells with hyperchromatic, randomly arranged nuclei characteristic of a neoplastic process, which was recognized as olfactory neuroblastoma (*esthesioneuroblastoma*) (Fig. 2).

During the next few days the condition of the dog deteriorated considerably. Epistaxes recurred, the animal becoming increasingly weaker, it had difficulty keeping its balance and had to be assisted in walking. Swallowing difficulties appeared (also while drinking water), and the dog had to be fed by hand. In addition, a complete loss of smell was observed. The owners did not consent to radiotherapy or chemotherapy. Because the prognosis was unfavorable, they decided to euthanize the animal and consented to an autopsy, which was conducted in accordance with the generally accepted rules. After opening the nasal cavity, large amounts of mucus and blood secretion were discovered in its posterior part, as well as a cauliflower-like hyperplasia completely blocking the right nasal canal. The autopsy did not show lesions typical of neoplastic metastases in the local lymph nodes or the internal organs. Material was taken from the lesions in the nasal cavity for a histopathological examination. The specimens were fixed in 10% buffered formalin and embedded in paraffin blocks in a tissue processor (Leica TP-20). Tissue slices, 4 µm thick, made with a sliding microtome (Leica SR-200) were placed on microscope slides. The preparations for the histopathological evaluation were stained with hematoxiline and eosine (HE) and evaluated in a light microscope (Nikon Eclipse E-600) on the basis of the histological classification of respiratory system tumors of pets according to the WHO (2). Clusters of small cells with a hyperchromatic oval nucleus and a small amount of cytoplasm surrounded by connective tissue stroma with numerous vessels were observed under the microscope. The cells forming the structure of the neoplasm were mostly chaotically arranged. In some small areas of the tumor, more regular patterns of a radial structure resembling Homer-Wright rosettes were observed (Fig. 3). There were also extensive blood extravasations and areas of necrosis. On the basis of these features of histological structure, the neoplastic hyperplasia was classified as an olfactory neuroblastoma (*esthesioneuroblastoma*).

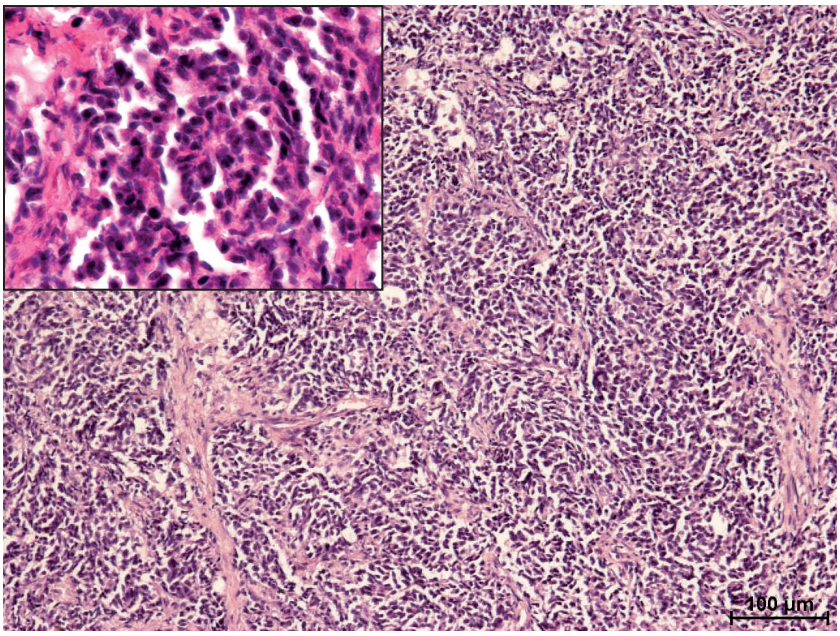

Fig. 3. A microscopic picture of the olfactory neuroblastoma – case 1. Solid clusters of small cells with a hyperchromatic oval nucleus and scarce cytoplasm occasionally forming radial structures resembling Homer-Wright rosettes. Staining HE. Magn. approx. 100 ×. In the left upper corner: the picture of the neoplastic cells in a higher magnification (400 ×)

Case 2. A male dog, breed Siberian Husky, aged 11 years with symptoms of idiopathic epistaxes. The symptoms had first appeared about 3 months before the visit to the clinic, and had been recurring regularly at 1-2 week intervals. After each bleeding, the dog was apathetic and showed a lack of appetite. The bleeding had been accompanied by snoring and head shaking, resulting in blood smears in the surroundings. The owners reported that the dog had lost a lot of weight recently. The animal received a clinical examination, a blood sample was taken for hematological, biochemical, and molecular tests for ehrlichiosis and anaplasmosis, as well as to determine coagulation parameters. Finally, a head x-ray examination was conducted.

The hematological test did not reveal any irregularities apart from a minor thrombocytopenia (192×10^9/l). A biochemical test of the blood serum did not show any deviations from physiological norms either. AST, ALT, AP activity, urea, glucose, creatinine, bilirubine concentration, and the levels of calcium, magnesium, sodium, and chlorides were within the normal physiological range. The PCR test did not detect genetic material of *Ehrlicha canis* or *Anaplasma phagocytophiulum*. Coagulogram only showed a raised fibrinogen level (567 mg/dl). The other coagulation parameters were within physiological norms: PT 8.5 s; the PT indicator 147%; INR 0.67.

The radiographic head examination indicated slightly pronounced asymmetric osteolytic lesions in the area of the nasal cavities (Fig. 4) and unilaterally decreased aeration in the ethmoid bone region of the nasal cavity. The results of the radiographic imaging were not characteristic enough to make a final and definite diagnosis possible; therefore, a rhinoscopy appeared to be necessary.

A rhinoscopic examination was carried out analogously to case 1. Severe hyperemia of the choanae mucosa was found with large, visible blood vessels. The choanae arrangement was disturbed – a large hyperplasia closing the

Fig. 4. Small area of osteolysis against the right-hand side nasal concha structures in the background (case 2)

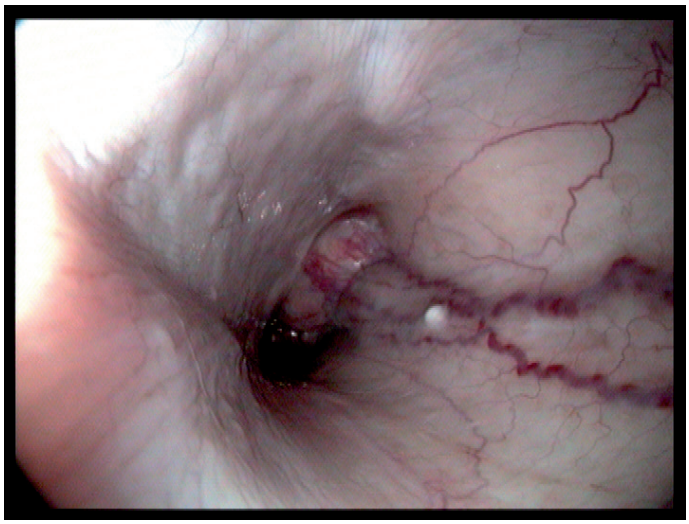

Fig. 5. Hyperplasia closing the left nasal canal and infiltrating the right nasal canal of the dog from case 2

left nasal canal and infiltrating the right nasal canal was discovered (Fig. 5). The mucosa of the right nasal cavity was pink, the nasal laminas in the front part were developed correctly, but in the posterior part a hyperplasia was found to partly close the nasal canal. The left nasal cavity, with a softened hyperemic mucous membrane, was filled with a large amount of purulent secretion. In the posterior part (from 3 cm onwards), pathologically changed nasal laminas were detected – inaccessible for examination due to a hyperplasia completely blocking the nasal cavity and due to residual pus, which could not be removed. The picture of the lesions thus observed indicated a possible neoplastic hyperplasia. During the rhinoscopy, bioptats were taken from the changed sites for histopathological examination, and swabs were collected for microbiological tests. In microscopic specimens made from the bioptats, under thinned and in many places desquamated or ulcerating epithelium adjacent to strongly dilated blood vessels, there was an extensive infiltration made up of randomly arranged, cylindrical and polygonal cells with pronounced nuclear pleomorphism, fixed in a scarce edematous, inflammatorily changed connective tissue stroma (Fig. 6). These features indicated unambiguously the neoplastic character of the process, and the microscopic traits suggested an epithelium-derived malignant tumor. Microbiological tests of the nose swabs did not reveal the presence of pathological flora.

As in the previous case, the owners did not consent to treatment and chose to have the dog euthanized. Lesions observed during the post-mortem examination of the nose were consistent with the rhinoscopic examinations. During the autopsy, specimens were taken again from the hyperplasia in the nasal cavity for histopathological examination. This confirmed the presence of multinodular, densely cellular, unencapsulated neoplasm infiltrating the adjacent tissues and consisting of thick, chaotically arranged, cords and nests of cylindrical and polygonal cells with indistinct cell borders separated by thin fibro-vascular stroma. The neoplastic cells had a light eosinophilic, slightly granular cytoplasm, a centrally positioned round or oval cellular nucleus of coarse chromatin, and contained one or two prominent nucleoli (Fig. 7). Anisocytosis and anisocariosis of moderate grade with numerous hyperchromatic nuclei

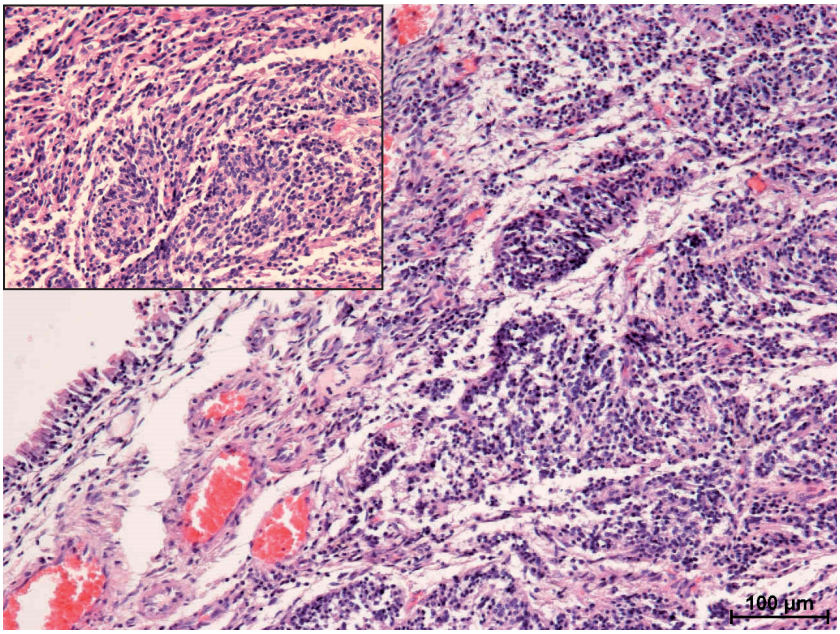

Fig. 6. A microscopic picture of the bioptat from the nasal mucosa – case 2. An extensive infiltration of cylindrical and polygonal neoplastic cells under the desquamating epithelium. Staining HE. Magn. approx. 100 ×. In the left upper corner: the picture of the neoplastic cells in a higher magnification (200 ×)

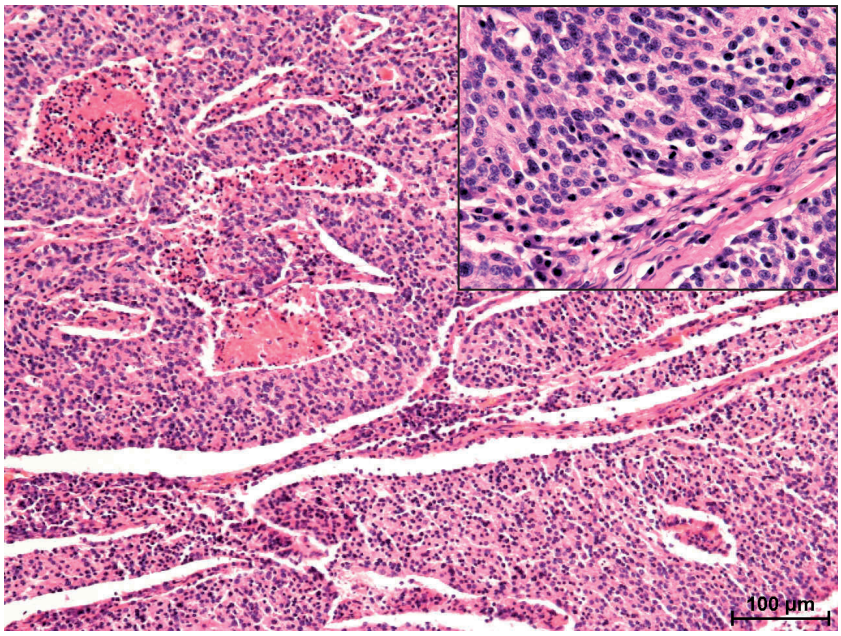

Fig. 7. A microscopic picture of the nasal transitional carcinoma – case 2. Multi-layer strata of neoplastic cells separated by stromal connective tissue stripes. Staining HE. Magn. approx. 100 ×. In the right upper corner: a picture of the neoplastic cells in a higher magnification (400 ×)

were observed, and the number of mitotic figures was 2-3 per high-power field. Between the strata of neoplastic cells, there were oval, clearly separated areas containing necrotic debris. In some areas of the tumor, a slight tendency to form gland-like structures or foci of squamous epithelial metaplasia was observed, and in the stroma, especially in the circumpherical growth zone, focal infiltrations of inflammatory cells consisting mostly of lymphocytes and plasmocytes were present. These features in the microscopic picture, especially the shape and arrangement of the cells and the absence of a generalized tendency for their squamous metaplasia, were suggestive of transitional carcinoma (*carcinoma transitionale*) (1, 2, 20).

Discussion

Rhinoscopy is an important procedure to include in the examination of patients with upper airway disorders. It is simple to perform, yields important information, saves the patient from invasive rhinotomy, and improves relations with the client when a diagnosis is reached (11). Rhinoscopy makes it possible to inspect directly and precisely most surfaces of the nasal mucosa, and, more importantly, to obtain the most representative tissue samples for cytology, histopathology and microbiology. The procedure complements more advanced diagnostic techniques, such as CT. CT provides detailed information regarding the extent of the disease, and can be used for an accurate discrimination of neoplastic versus non-neoplastic diseases. However, the final diagnosis requires bioptats to be taken from the changed sites, which can be done during the rhinoscopy (5).

Rhinoscopy makes it possible to diagnose such diseases and disorders as nasal neoplasia, lympho-plasmacytic rhinitis, orfungal, and bacterial rhinitis. Other diagnoses include nasal foreign bodies, nasal polyps, granulomatous rhinitis, oro-nasal fistula, and naso-pharyngeal stenosis (7). Sometimes, especially in the cases of foreign objects and congenital abnormalities, rhinoscopy may be sufficient for a final diagnosis. However, even in these situations and also when any macroscopic lesions are found during endoscopy, a microscopic examination of mucosa specimens should be performed (17).

In the present study, in both dogs the x-ray examination alone, with no possibility of using CT, did not prove accurate enough to detect the presence of neoplastic lesions in the nasal cavity. Similar observations were made by Tasker et al. (19). In a study comprising forty two dogs with a history of persistent nasal disease, they proved that anterograde rhinoscopy and retroflexed endoscopy had higher specificity and sensitivity than radiology for the diagnosis of neoplasia, inflammatory rhinitis, aspergillosis, and foreign bodies.

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. Sapierzyński and Żmudzka (17) observed only moderate discoloration of the mucosa without any hyperplastic or destructive lesions during rhinoscopy in two dogs in which histopathology revealed the presence of adenocarcinoma. In another study, final diagnosis could be obtained by rhinoscopy alone in only 8% of cases of chronic nasal disease (6).

In the above-mentioned cases, the endoscopic picture of the nasal cavity made it possible to achieve a preliminary diagnosis of neoplastic disease, which was intravitally confirmed by a histopathological examination of bioptats taken from the changed sites. Although their microscopic picture did not permit a definite determination of the histopathological type of the neoplasms, mainly because of the small diameter of the specimens, as well as the fact that they were obtained from the inflammatorily changed mucosa, the presence of neoplastic cells in both cases was beyond doubt. The histopathological examination of the specimens taken during the autopsy confirmed and completed the intravital evaluation. In the clinical differential diagnosis, we took into consideration disorders involving the abnormal function of the blood clotting system, as well as ehrlichiosis and anaplasmosis. Epistaxis, or nasal bleedings with sneezing, is more often seen in a chronic, severe form of monocytic ehrlichiosis and anaplasmosis. PCR, haematology, and

rhinoscopy can easily exclude these differentials (13). Both dogs, tested molecularly (PCR) for these two infectious diseases, were negative. Other possibilities, such as nasal mycosis, were ruled out by rhinoscopy and microbiological examinations of the nasal swabs.

Radiotherapy and chemotherapy are commonly used in the treatment of nose neoplasms. Although both methods of treatment are characterized by a relatively high effectiveness (3, 4, 10), in both cases described here the owners chose euthanasia of their dogs because of the costs involved in the therapy, especially considering the uncertain prognosis.

Conclusions

In the available literature, rhinoscopy is presented as a diagnostic technique of significant importance for diagnosing nasal tumors of different origins (5, 12, 13, 17, 19). It is undoubtedly a technique complementary to CT, and if the latter cannot be conducted, it should constitute the basis for a preliminary diagnosis of a neoplastic process, along with a radiological examination. The results should be confirmed by a cytological or histopathological examination of bioptats taken from the changed sites.

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