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Clinical, Rhinoscopic and Computed Tomographic Studies in Twenty Dogs with Nasal Tumours

Annie Mariam John[1], G. Vijayakumar[1], S. Kavitha[1], Mohamed Shafiuzama[2]

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ABSTRACT

Background: Nasal tumours of dogs often pose a diagnostic challenge due to their similar clinical manifestations with other chronic diseases. Therefore, their definitive diagnosis requires use of different diagnostic modalities like radiography, computed tomography and rhinoscopy along with biopsy. The present study evaluates the clinical, rhinoscopic and computed tomographic changes in 20 dogs with intranasal tumours.

Methods: Dogs brought with clinical signs suggestive of nasal cavity diseases were screened by radiography and computed tomography of skull followed by rhinoscopy and biopsy of nasal mucosa for diagnosing nasal tumours.

Result: The intranasal tumours encountered were- carcinoma, transmissible venereal tumour and haemangioma. Clinical signs, haemato-biochemical, radiographic, computed tomographic and rhinoscopic changes in dogs with intra nasal tumours confirmed through histopathological studies are presented.

Key words: Computed tomography, Dogs, Nasal tumour, Rhinoscopy.

INTRODUCTION

Intra nasal neoplasia accounts for 1-2 per cent of all tumours in dogs and cats (Malinowski, 2006). Clinical signs of intranasal diseases in dogs are unilateral or bilateral nasal discharge, sternutation, stridor, foul-smelling breath, epistaxis, cough, respiratory distress, nasal crusts or epithelial lesions and facial deformities (Auler *et al*., 2015). Radiography may reveal abnormal soft tissue opacity in nasal cavity, turbinate loss or invasion of bone but it often fails to detect pathological changes in early cases. Computed tomography provides better visualization of structures than radiography as it eliminates superimposition of the images of different anatomical structures. Rhinoscopy provides direct visualization of the nasal surface and is useful in obtaining tissue biopsy (Harris *et al*., 2014).

[1]Department of Veterinary Clinical Medicine, Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University, Chennai-600 007, Tamil Nadu, India.
[2]Department of Veterinary Surgery and Radiology, Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University, Chennai-600 007, Tamil Nadu, India.

Corresponding Author: Annie Mariam John, Department of Veterinary Clinical Medicine, Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University, Chennai-600 007, Tamil Nadu, India. Email: anniemariamjohn@gmail.com

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MATERIALS AND METHODS

Dogs brought to the Small Animal Out-Patient unit of Madras Veterinary College Teaching Hospital from March 2021 to November 2022 were utilized for the study. For this, 44 dogs with history and clinical signs suggestive of nasal cavity diseases like nasal discharge, stridor, foul-smelling breath, epistaxis, sneezing, respiratory distress or facial deformities were screened. These were subjected to detailed clinical, haemato-biochemical, radiographic, computed tomographic and rhinoscopic examinations.

All diagnostic imaging were done in these dogs under general anaesthesia in a standard manner. The radiographs of skull were taken in standard dorsoventral (DV) and lateral views. Computed tomography of skull was performed as described by Schwarz and Saunders (2011) where contiguous images were obtained from the caudal limit of the frontal sinuses to the nares with the animal on sternal recumbency.

Rhinoscopy was performed as per the procedure described by McCarthy (2005) using anterograde and retrograde methods. A flexible bronchoscope (bronchoscope 3.5 mm diameter with two-way deflection- Olympus type BF 1T150, Japan) was used for posterior rhinoscopy. An arthroscope with cystoscopy sheath (2.7 mm 30-degree Karl Storz, Germany) was used for anterior rhinoscopy. Nasal swabs obtained from both nasal cavities were subjected to cytological analysis. Tissue sample obtained using endoscopic forceps were fixed in 10 per cent formalin and used for histopathological studies (Bancroft and Gamble, 2008). The data obtained in the study were subjected to statistical analysis as described by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

In the present study, nasal tumours identified were carcinoma (70 per cent; 14/20), transmissible venereal tumour (20 per cent; 4/20) and haemangioma (10 per cent; 2/20). Ogilvie and LaRue (1992) and Malinowski (2006) reported that two third of the nasal tumours in dogs was carcinoma.

In the present study, dogs were aged between 1 and 15 years. The mean age of dogs with malignant neoplasia was 8.6 years consistent with the findings of Ogilive and LaRue (1992). Dogs with nasal TVT in the present study were sexually intact with a mean age of 4 years similar to the findings of Papazoglou *et al.* (2001). In the present study, a sex predilection was found for male dogs (male 65 per cent; female 35 per cent) for nasal tumours and was similar to reports of Malinowski (2006).

Clinical findings of dogs with nasal tumour in the present study are indicated in the in Table 1 and Plate 1. The predominant clinical findings in dogs with neoplasia were mucohaemorrhagic nasal discharge (9/20; 45 per cent), facial deformity (10/20; 50 per cent), stertor (10/20; 50 per cent) and open mouth breathing (3/20; 15 per cent). Haemorrhagic nasal discharge unilateral initially and later progressing into bilateral was mostly consistent with nasal neoplasia (Plickert *et al*., 2014). Facial deformity had a strong association with malignant neoplasia. Advanced stage of nasal neoplasia was commonly presented with facial deformity, neurological signs and exophthalmos (Mortier and Blackwood, 2020). Nasal discharge in dogs with nasal TVT were purely haemorrhagic and was concurrent with sneezing. Similar signs were reported by Dhillon *et al*. (2021) in dogs with TVT.

Dogs with intranasal tumours in the present study had a reduced mean red blood cell count, haemoglobin and haematocrit and an increased mean leukocyte count compared to that of the respective mean of the healthy dogs.

Plate 1: Clinical signs in dogs with nasal tumour.

In contrast, the haematological and serum biochemical values in dogs with neoplasia were unremarkable according to previous studies (Table 2) (Swinbourne *et al*., 2014; de Toledo *et al*., 2018 and Hamon *et al*., 2019). Anaemic changes in dogs with intranasal neoplasia might be due to chronic blood loss in nasal discharge.

The radiographic and tomographic findings in the present study were unilateral or bilateral opacities of the nasal cavity or frontal sinus with or without osteolysis (Plate 2). Radiographic findings in cases of histologically or cytologically confirmed neoplasia were radiopacity, bone lysis and frontal sinus involvement (Ogilvie *et al*., 1992; Auler *et al*., 2015). In skull CT, moderate to severe bone lysis, soft tissue opacity and contrast enhancing mass in the nasal or paranasal sinus was present in all patients diagnosed with nasal tumour (Plate 3). Saunders *et al.* (2003) observed soft tissue opacity in skull CT of dogs with neoplasia and opined that cribriform plate compromise, lysis of naso-orbital and periorbital bone strongly suggested malignancy.

The common rhinoscopic changes observed in all dogs with chronic nasal diseases were congestion and excessive fragility concurrent with the findings of Sapierzyński and

Table 1: Signalment and Clinical signs in dogs with nasal tumour.

Case	Breed	Age (years)	Sex	Clinical signs	Diagnosis
01	Labrador retriever	4.5	M	B-Con, B-MH- ND	Carcinoma
02	Non-descript	9.0	M	U-MH- ND, FD, St, Sn	Carcinoma
03	Kombai	2.0	M	U-Ep, Sn	Nasal TVT
04	Mixed breed	4.0	M	Sn, U-Ep, FD	Carcinoma
05	Non-descript	4.0	M	U-Ep, Sn, St, MB	Nasal TVT
06	Dalmatian	12.0	M	U-MH- ND, FD, Sn, MB	Adenocarcinoma
07	Non-descript	1.0	F	U-Ep, Sn, STG from nares	Carcinoma
08	Non-descript	13.5	M	U-Ep, St, MB	Carcinoma
09	Spitz	6.0	M	U-Ep, Sn	Nasal TVT
10	Non-descript	12.0	F	U-MH- ND, Sn, FD	Carcinoma
11	Spitz	12.0	M	U-MH- ND, Sn	Adenocarcinoma
12	Labrador retriever	4.5	F	U-MH- ND, Sn, FD, St	Haemangioma
13	Spitz	9.0	M	B-Ep, Sn, FD, St	Carcinoma
14	Non-descript	8.0	M	U-MH- ND, Sn, FD, St, EX	Carcinoma
15	German Shepherd	10.0	F	U-Ep, Sn	Carcinoma
16	Non-descript	8.0	F	U-MH- ND, Sn, FD, St, EX	Carcinoma
17	Spitz	15.0	M	B-MPu-ND, St, FD, STG in oral cavity	Carcinoma
18	Spitz	6.0	F	U-MH- ND,Sn, FD, St, EX	Squamous cell carcinoma
19	Non-descript	5.0	F	U-Ep, Sn, St	Haemangioma
20	Spitz	7.0	M	U-Ep, Sn, submandibular lymphadenopathy	Nasal TVT

U- Unilateral; B- Bilateral; M - Mucous; H- Haemorrhagic; Pu- Purulent; Con- Conjunctivitis; EP; Epistaxis- EX; Exophthalmos; FD- Facial deformity; MB- Mouth breathing; ND- Nasal discharge; Sn- Sneezing; St- Stertor; STG- Soft tissue growth.

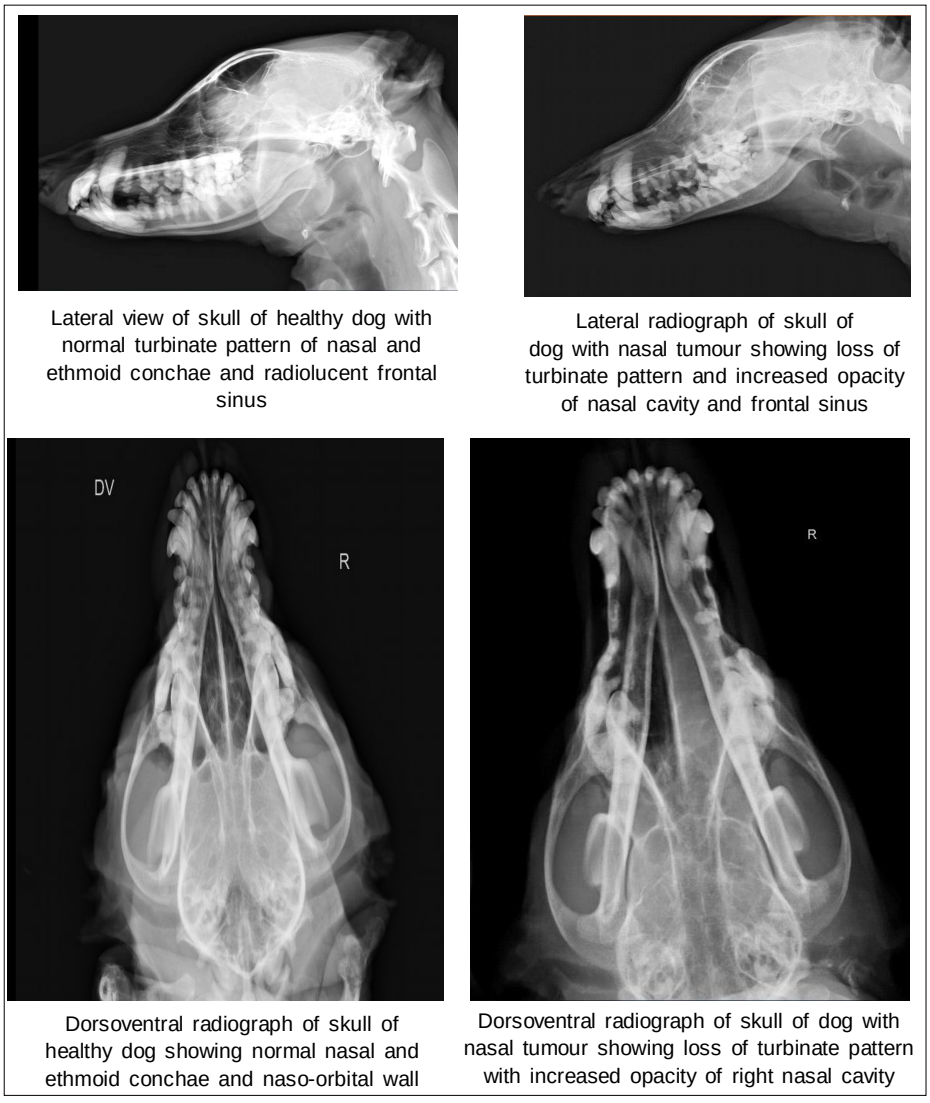
Table 2: Haemogram and serum biochemistry in apparently healthy dogs and dogs with nasal tumour (Mean±S.E.).

Parameter	Apparently healthy dogs (n=10)	Dogs with nasal tumour (n=20)	"t" test
Hb g/dL	15.09±0.32	13.27±0.33	3.476**
PCV %	44.73±0.92	37.14±1.29	3.882**
RBC 10^6/cmm	6.85±0.15	6.16±0.18	2.459*
PLT 10^5/cmm	2.5±0.25	3.45±0.34	1.836^{NS}
WBC 10^3/cumm	12.53±1.11	22.47±2.70	2.528*
Neutrophils 10^3/cumm	9.14±0.79	17.45±2.56	3.097**
Lymphocytes 10^3/cumm	2.85±0.27	2.60±0.25	0.65^{NS}
Monocytes 10^3/cumm	0.52±0.06	0.96±0.09	4.008**
Eosinophils 10^3/cumm	0.1±0.04	0.09±0.02	0.148^{NS}
Total protein g/dL	7.34±0.12	7.50±0.18	0.602^{NS}
Albumin g/dL	2.89±0.14	2.67±0.12	1.104^{NS}
Creatinine mg/dL	1.05±0.05	1.01±0.08	0.286^{NS}
ALT IU/L	51.3±6.33	39.30±3.44	1.819^{NS}

*Significant ($p<0.05$), ** Highly significant ($P<0.01$) and NS: Non significant ($p>0.05$).

Żmudzka (2009). Anterior rhinoscopy revealed nasal discharge, nasal mucosal hyperaemia, excessive fragility of nasal mucosa, nasal obstruction by tissue masses and increased space between turbinate due to turbinate destruction (Plate 4). In posterior rhinoscopy, haemorrhage in all the cases and obstruction of choanae with soft tissue mass in some cases were visualized in one case (Plate 4). Endoscopic picture of the nasal cavity made it possible to achieve a preliminary diagnosis of neoplastic disease, which was later confirmed by a histopathological examination of bioptats taken from the lesions. In some cases, biopsying a second sample was hindered by nasal haemorrhage during the same rhinoscopic procedure. Rhinoscopy is inevitable in the diagnosis of nasal disease in dogs despite its inability to fully determine lesion size and extension. Although malignant and non-malignant lesions are histologically differentiated based on rhinoscopy guided biopsies, secondary changes like the presence of fibrin deposits, necrosis and inflammation affects the quality of biopsy samples which interrupts the actual histologic interpretation and diagnosis (Auler *et al*., 2015).

Cytological analysis revealed carcinoma and transmissible venereal tumour cells in nasal swab cytology (Plate 5). The typical cytological characteristics of nasal cytology in dogs with nasal TVT were numerous discrete, round, individual cells with a moderate to high nuclear: cytoplasmic (N:C) ratio, moderate amounts of pale, basophilic cytoplasm and small, round, clear, punctate vacuoles in cytoplasm similar to the findings of Parker *et al.* (2021). The cytological features of carcinoma were cohesive sheets of cells with anisocytosis, anisokaryosis and marked nuclear to cytoplasmic ratio. Histopathological changes in the present study in dogs with adenocarcinoma were numerous glandular structures lined by proliferating epithelial cells with prominent nucleus and nucleoli whereas in haemangioma numerous dilated, hyperplastic and



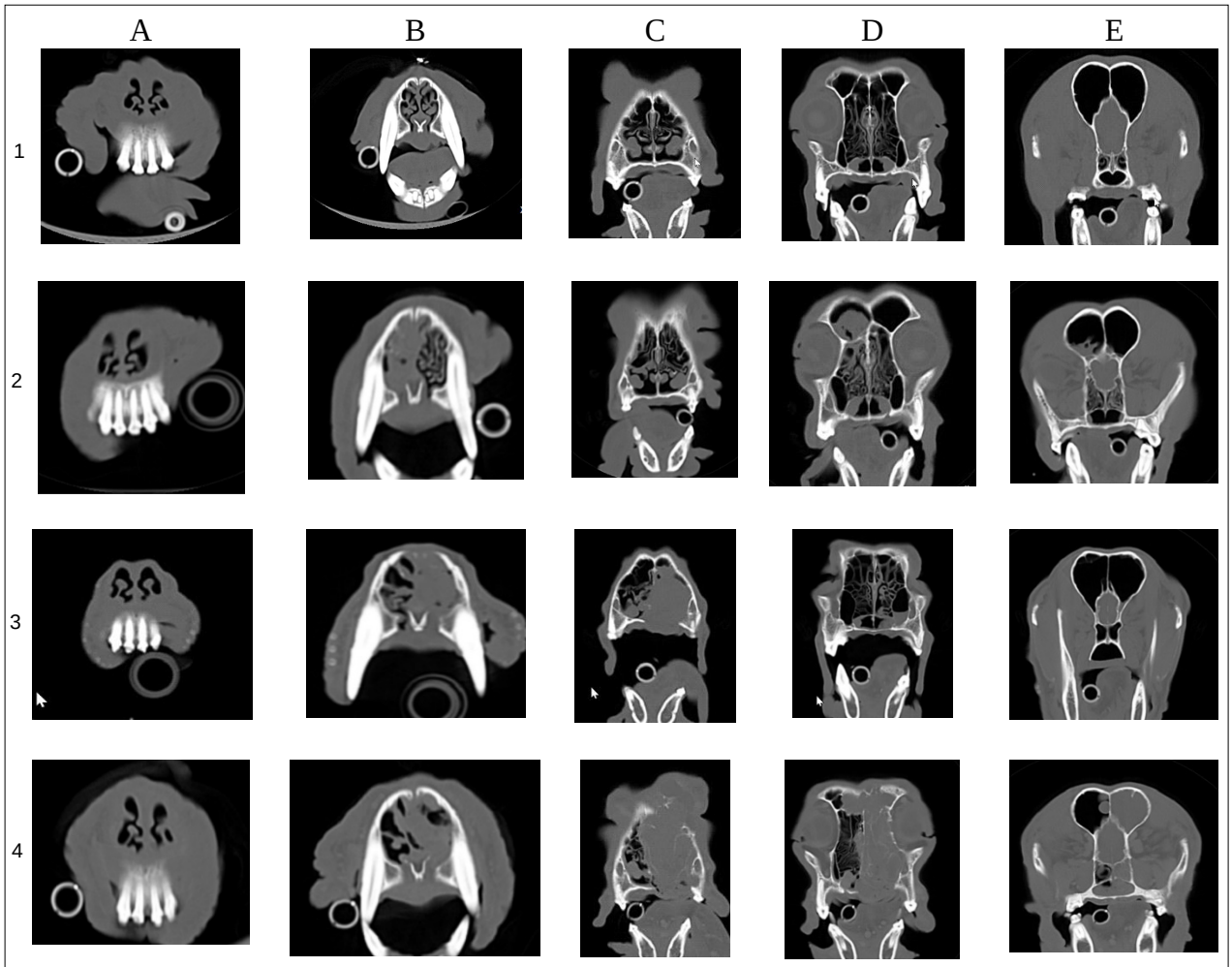
Lateral view of skull of healthy dog with normal turbinate pattern of nasal and ethmoid conchae and radiolucent frontal sinus

Lateral radiograph of skull of dog with nasal tumour showing loss of turbinate pattern and increased opacity of nasal cavity and frontal sinus

Dorsoventral radiograph of skull of healthy dog showing normal nasal and ethmoid conchae and naso-orbital wall

Dorsoventral radiograph of skull of dog with nasal tumour showing loss of turbinate pattern with increased opacity of right nasal cavity

Plate 2: Radiography of dog skull.



Sequential computed tomography images through the nose of (1) normal dog; (2), (3) and (4) dog with nasal tumour. A: at the level of incisors, B: at the level of canine, C: cranial to the orbital region,D: at the level of nose through orbital region and E: through frontal sinus. 1. Clear nasal passage showing (A) nasal meatus (B), (C) rostral nasal turbinates (D) ethmoturbinates and nasopharynx free of tissue density and (E) frontal sinus with radiolucency and free of tissue density.2. The left nasal cavity (B) filled by homogenous soft-tissue density with extensive turbinate destruction (D)and (E) dependent soft tissue density of the left ventral frontal sinus.3 (B), (C) A large soft tissue mass fills the right nasal cavity and extends across midline. The right turbinates are obliterated by the mass with nasal septum destruction (D) Soft tissue density of right nasopharynx and maxillary recess.4 (B) destructive soft-tissue mass predominantly on right nasal cavity invading the nasal septum (C) osteolysis of nasal bone dorsally and destruction of the hard palate (D) extension of mass into right nasopharynx and osteolysis of frontal bone and (E) soft tissue opacity of right frontal sinus.

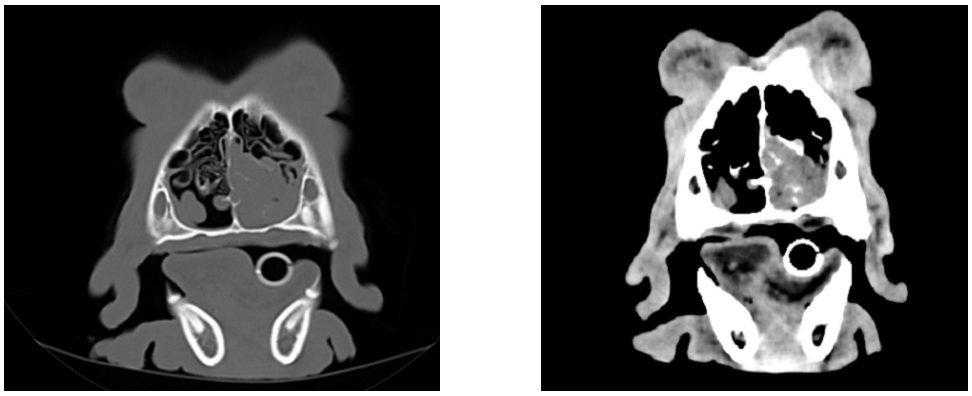
Plate 3a: Computerized tomographic images of dog skull.

pleomorphic submucosal glands were evident. Variably sized squamous epithelial cells surrounded by inflammatory cells were the histologic features in dogs with nasal squamous cell carcinoma (Plate 6). Similar cytological and histopathological features were described by Bancroft and Gamble (2008) and Burton (2018) in dogs with nasal neoplasia.

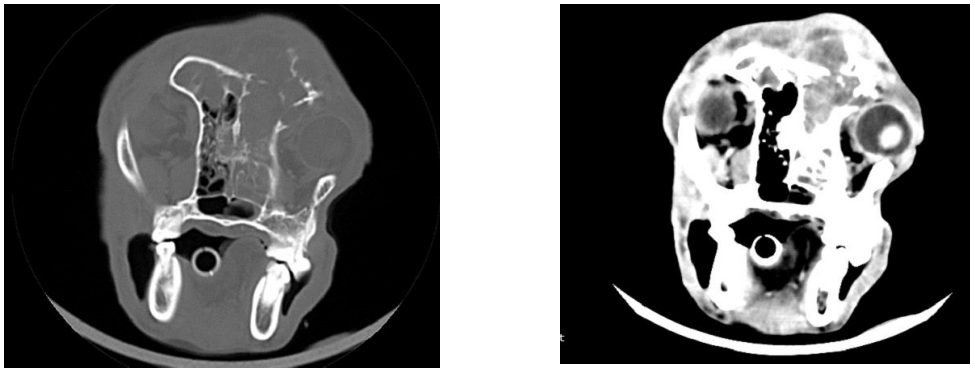
CONCLUSION

Based on present study, it can be concluded that although clinical signs like facial deformity and chronic nasal discharge especially sanguineous nature prompts diagnosis towards nasal neoplasm, imaging modalities and histo-pathological studies are needed for confirmative diagnosis. Computerized tomography of skull provides details in localization of lesion, extent of involvement of adjacent structures and rhinoscopy facilitates evaluation of type of lesion, air patency and provided image guided biopsy for definitive diagnosis.

Conflict of interest: None.

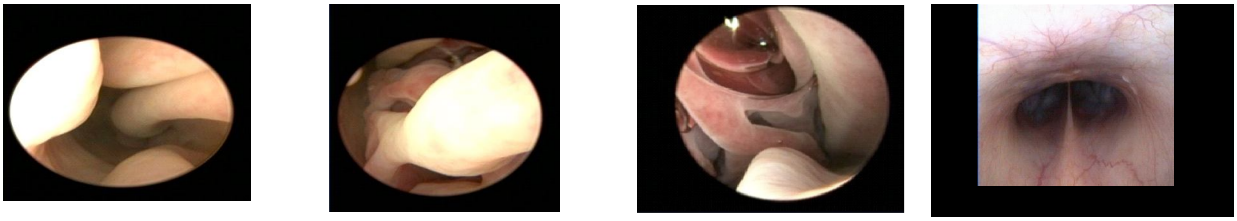


Soft tissue opacity and corresponding contrast enhancing mass in the right ventral nasal cavity



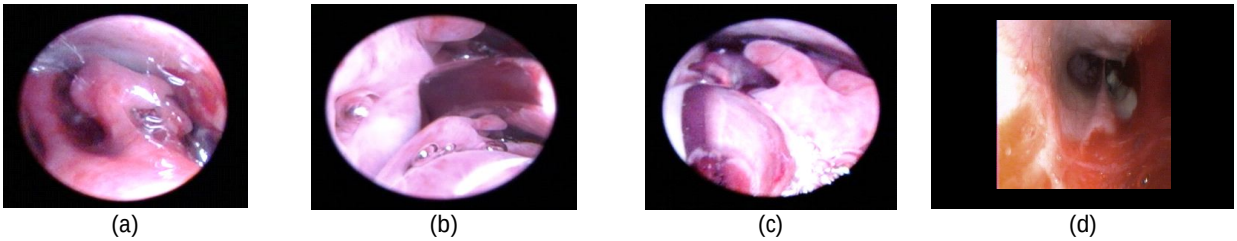
Unenhanced and corresponding enhanced image showing soft tissue mass with extensive destruction of turbinates, nasal septum and frontal bone

Plate 3b: Computerized tomographic images of dog skull.



(a) (b) (c) (d)

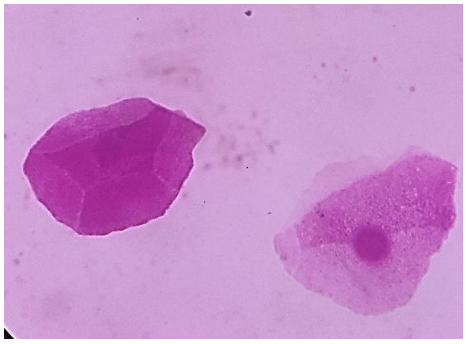
Anterior Rhinoscopy in healthy dogs: a. Nasal cavity with meatus; b and c. Turbinates
d. Posterior rhinoscopy revealing choanae.



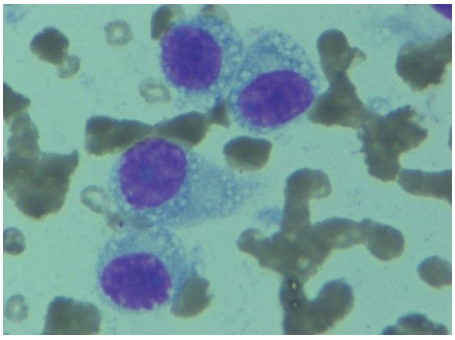
(a) (b) (c) (d)

Rhinoscopy in dogs with nasal tumour: a. Tumour mass in the nasal cavity b. Haemangioma in nasal cavity
c. Big tumour mass between turbinates.
d. Posterior Rhinoscopy: Bleeding from the tumour mass occupying chonae.

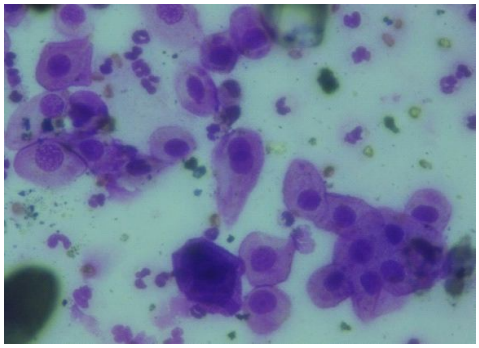
Plate 4: Rhinoscopy.



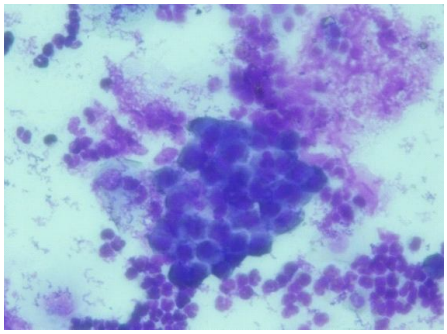
Normal nasal cytology 10X



TVT cells with intracytoplasmic vacuolations 100X

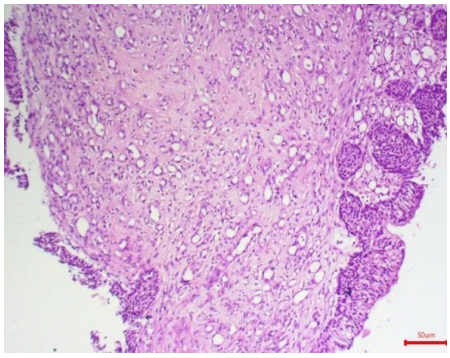


Carcinoma 100X

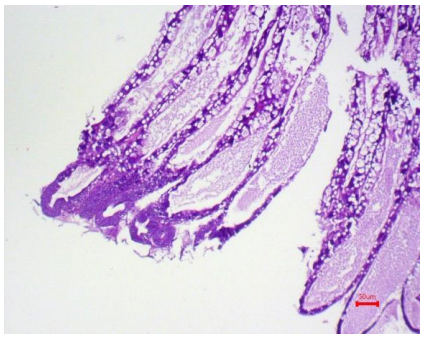


Carcinoma 100X

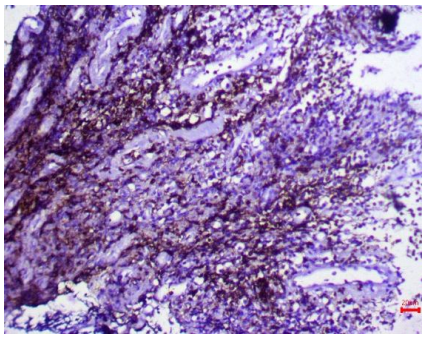
Plate 5: Cytology.



Hemangioma - H and E- Bar=50 µm



Adenocarcinoma - H and E - Bar=50µm



Adenocarcinoma - CK - Bar=50 µm

Plate 6: Histopathology.

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