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“The Approach to Nasal Discharge in the Dog”

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Investigation of Nasal Disease of the Dog

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One would believe that the investigation and diagnosis of nasal disease in the dog should be straightforward. After all, the signs and history are often simple leading directly to the exact anatomical location of the problem. However, due to the complex nature of the nasal cavity and its associated structures, coupled with the small number of signs possible irrespective of cause, the definitive diagnosis of nasal disease can be difficult and sometimes elusive.

I would like to review the anatomy of the nasal cavity, nasal sinuses and nasopharynx before covering the diagnostic approach to nasal disease. Finally, in this presentation, I will briefly describe the most commonly encountered diseases seen in dogs in Australia.

NASAL ANATOMY

The nasal chamber of the dog varies dramatically in appearance mainly due to conformational differences between breeds. Dogs such as Chihuahuas have a short nasal chamber with no, or next to no frontal sinuses whist dogs such as Collies have well defined structures, however the choanae, being so small, make it difficult for instrumentation to visualise the internal structures. The various breeds can all be grouped into brachycephalic, mesocephalic or dolichocephalic head shape.

The nasal chamber is divided into left and right sides by a midline septum. Functionally, there is a nasal entrance, a respiratory chamber with main function being humidification of air and thermoregulation, an olfactory chamber leading to the ethmoid, and the nasal exit, consisting of meatis nasopharyngeus and nasopharynx. Within each nasal chamber there are two horizontal ledges (the dorsal nasal concha (dorsal nasoturbinate) and the ventral nasal concha (maxilloturbinate) that further subdivide the nasal cavity into dorsal, middle and ventral meati. Adjacent to the midline is the common meatus. Within each of these lateral meati, there are further numerous bony scrolls (the nasal and ethmoidal conchae) that aid with humidification of the air as it proceeds towards the lung. At the caudal end of the nasal chamber, there is the ethmoid being immediately rostral to the cribriform plate. This plate is fenestrated allowing direct neurological communication with the olfactory bulbs. If following the ventral choanae caudally, eventually the internal nares are reached, opening into the common nasopharyngeal cavity.

There are also paranasal sinuses that communicate with the nasal cavity being the frontal sinuses, consisting of rostral, lateral and medial components, as well as the maxillary recess.

An understanding of the anatomy greatly assists with the understanding of diagnostic imaging and rhinoscopy when performed.

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CLINICAL SIGNS OF NASAL AND NASOPHARYNGEAL DISEASE

Signs tend to be very specific making it relatively easy to localise the problem. Commonly they include sneezing, nasal irritation or rubbing, snorting, nasal discharge, epistaxis and nasal deformity. Less frequent signs include depigmentation of the nasal planum, protrusion of tissue from either external or internal nares, open-mouth breathing, nasal pain and restriction of air movement through the nares. Occasionally other organs become involved, for example blockage of the opening of the tear duct within the nose leading to epiphora, or lymphadenopathy.

Nasopharyngeal disease is usually present when there is stertor and snorting, repeated gagging or swallowing movements, snoring when asleep and reverse sneezing.

DIAGNOSTIC INVESTIGATION OF NASAL DISEASE

A standard and consistent approach to nasal disease works best.

Firstly, the signalment of the dog should be considered. For example, fungal rhinitis tends to affect dolicocephalic dogs rather than brachycephalic. Nasal neoplasia tends to be a disease of older dogs, whilst foreign bodies will be found in the noses of young dogs due to their inquisitive nature. Occasional breed predispositions are mentioned, such as the whippet and dachshund being predisposed to chronic hyperplastic rhinitis. Gender difference seems to play little role. Animals from suburban or rural areas will tend to have a higher likelihood of fungal disease.

The history of onset and change in signs can assist. A sudden and violent onset of signs, decreasing in intensity within a few days can be due to the presence of foreign bodies. Gradual onset and progression of signs suggests an infiltrative process, such as neoplasia.

Clinical examination is a powerful and cost-effective tool. Visual assessment of the nasal region and associated structures such as eyes, dentition, facial bones may reveal asymmetry, discharges (which can be classified by their nature), epiphora, exophthalmos, and retinitis in cases of infectious disease or lymphoma. Depigmentation of the nasal planum or nasal pain may suggest mycotic rhinitis. An easy means of identifying whether there is air flow through the nose is to hold up a glass slide just in front of the nares and observe for symmetrical fogging of the slide. Gently occluding one nostril at a time may also identify obstruction to airflow on one side. The oral cavity should be carefully examined for evidence of dental disease, fistula formation, loss of bone integrity in the hard palate, protrusion of the soft palate and any foreign material visible at the soft palate.

Where epistaxis or serosanguineous nasal discharge is the major presenting complaint, coagulation tests and measurement of systemic blood pressure should be performed. These will not be detected in any of the following tests!
Clinical pathology plays only a limited role with nasal disease. Haematology may reflect an inflammatory change. Circulating neoplastic cells, including lymphoma or plasma cells, rarely would be reported. The presence of multiple myeloma may be detected through dramatically elevated serum globulin concentrations. Coagulation profiles however are very important in dogs with epistaxis as a major presenting sign. Serology can play a part when fungal rhinitis is suspected - particularly so for *Aspergillus fumigatus*.

All further investigation will require the dog to be anaesthetised.

Cytoogy and bacterial culture of nasal swabs are highly over-rated and rarely diagnostic of specific cause. Bacterial rhinitis is extremely common, but typically secondary.

Fungal cultures are another matter however. The culture of a fungal species can assist with decision making related to selection of antifungal agents for long-term management of these cases. However, once again, take care when a fungal species is isolated, as transient inhabitation of the nasal cavity is known to occur even where there is no nasal pathology. So a fungal isolation must be made in combination with cytological or histopathological identification of fungal elements before mycotic rhinitis is diagnosed.

Samples of fungal plaques collected from within the nasal chamber (typically during rhinoscopy) can be examined for the presence of hyphae. This is a highly specific, but only moderately sensitive technique.

Histopathology of tissue samples is a far more powerful tool in the diagnosis of nasal disease. The limitation of this however is the procurement of the tissue sample, and knowing how representative it may be of any pathology. Typically, biopsies are taken only once diagnostic imaging or rhinoscopy has been performed. This is partly to determine where to collect biopsies from. Also post-biopsy haemorrhage will obscure rhinoscopy.

Diagnostic imaging for most practitioners means radiography. This remains a very powerful tool as long as attention is paid to detail when obtaining images. However, it must be accepted that radiography will be far less sensitive for detection of pathology than advanced imaging is capable of. Careful alignment to maintain symmetry is critical to given the clinician the most perfect comparator for normality - the other side! If the dog’s head is aligned squarely whenever DV or VD views are taken, any asymmetry is easily identified and hopefully can assist with the making of a diagnosis. Typical views taken are DV, VD or open mouth VD views of the nose. Of these three, I believe that only the open-mouth VD is worth taking. Any views taken with the mouth shut only confuse matters due to the overlying mandibles, tongue and other soft tissues. Skyline views of the frontal sinuses are very handy to identify fluid or tissue within the sinuses. Whilst a good lateral view can also identify this change, it does not identify which side is affected. Lateral and lazy lateral views of the nasal cavity can be useful to assess the health of the dental arcade and whether bone lysis or deformity of the nasal bones is occurring.
Advanced diagnostic modalities include CT and MRI scans. When a comparison of MRI with CT for nasal cavity disease was investigated, Moore and coworkers found that whilst both would identify nasal tumours, MRI provided greater anatomical detail. CT can have difficulty differentiating tissue from epistaxis or discharge, whereas MRI does not. MRI also revealed peritumour oedema and ventricular collapse which was not seen at all in CT images (Vet Rad 32:19, 1991). MRI has also been used to identify mycotic rhinitis due to its unique imaging qualities, whereas CT can only identify non-specific bone loss. In humans, MRI is the imaging modality of choice for investigation of nasopharyngeal disease.

Rhinoscopy can be performed with a number of different instruments - either rigid or flexible in nature. Usually, it is the smaller scopes that are rigid, however they carry the disadvantage of being potentially more traumatic to the nasal mucosa. Visualisation of the nasal chamber can assist with the identification and removal of foreign bodies, identification of tumour masses and therefore targeted biopsy collection, and identification of fungal hyphal matts or turbinate destruction, both important in the definitive diagnosis of mycotic rhinitis. Examination of the nasopharynx can be accomplished with a light source and dental mirror, or for better imaging, a flexible endoscope is retroflexed towards the internal nares.

Bibliography:
Please contact the owner.
Fungal Rhinitis

- Aspergillus fumigatus most likely
- Other species, such as Penicillium spp are very rare

**Aspergillus fumigatus: Profile**
- Saprophytic filamentous fungus
- Opportunist pathogen
- Higher risk in rural regions, but ubiquitous
- Rarely assoc. with foreign body, trauma, impacted tooth or neoplasia

**Predilections**
- Young to middle-aged dogs
- Dolichocephalic & mesocephalic breeds
- No sex predilection

**Clinical Signs**
- Nasal discharge - unilateral or bilateral
- Mucopurulent or sanguineous
- Occasionally epistaxis is initial sign
- Sneezing
- Nasal or facial pain
- Nasal deformity
- Nasal depigmentation
- Nasal ulceration
- Inappetance
- Rarely seizures

**Diagnosis**
- NO Test 100% diagnostic
- Radiography
- MRI
- Rhinoscopy
- Cytology
- Culture of organism
- Serology

**Radiography**
- Turbinate loss
- Increased radiolucency
- Usually in mid-nasal region

**MRI**
- Hyperintensity of tissue in T1, T2 and post-gadolinium T1 studies
- Loss of turbinate structures
- Sinus involvement

**Rhinoscopy**
- Fungal plaques or ‘balls’
- White to yellow-green
- Turbinate loss
- Sometimes difficult to find

**Cytology of samples**
- Characteristic fungal hyphae
- Branching, septate hyphae
- Discharge smears 13%, swabs 20%, endoscopic brushing 93%, squash prep of biopsy 100% sensitive Ref:D De

- Histopathology sensitive - but samples must contain plaques

**Culture of organism**

- Isolation assists with positive diagnosis
- Up to 40% of clinically normal dogs can have Aspergillus isolated from nose, but 100% specific if nasal discharge present
- Blind swabs only 19% sensitive
- Must be supported by radiographic evidence or visualisation of fungal material

**Serology**

- Antibody titres available
- Overall poor sensitivity for screening, but specificity relatively high
- Titres can remain elevated for months to years following successful eradication of organism

**Therapies**

- Topical treatment with antifungal
- Surgical treatment with antifungal
- Systemic treatment with antifungal

**Topical therapy**

- Imidazoles impair steroid synthesis - ergosterol
- Fungistatic at low concentrations
- Fungicidal at high concentrations
- Clotrimazole (Canesten®)
- Canesten - 1% topical solution in polyethylene glycol and isopropyl alcohol
- Home-made solution:
  - 2 x 500 mg pessaries of clotrimazole pulverised
  - Add powder to 100 ml polyethylene glycol 400
  - Warm on cooktop till dissolved
  - Use suspension whilst warm
- 1 x 24G Foley catheter with 30 ml balloon
- 2 x 12G Foley catheter with 5 ml balloon
- Gauze swabs
- Instil clotrimazole solution under slight pressure - total of 30 to 60 ml
- Rotate head about long axis every 15 minutes for total of 60 minutes
- Ensure adequate drainage before awakening patient
- Administer clotrimazole cream 1% cream through trephine holes to complete

**Topical therapy - prognosis**

- 40-86% success after single treatment
- Up to 90% success rate reported (range 83.3-100%) after >1 treatment
• Relapse following eradication is uncommon
• Treatment failure more common
• Repeat therapy
• Tube placement surgically
• Treatment to involve nasal sinuses
• Systemic medical therapy

• **Topical therapy - complications**
  • Pharyngeal/laryngeal inflammation and oedema
  • Post-treatment sneezing, epistaxis
  • Repeated gagging/swallowing
  • Bacterial rhinitis - up to 25% of cases
    • Discharge
    • No facial pain or epistaxis
  • Meningoencephalitis

• **Surgical treatment**
  • Dorsal flap approach
  • Thiabendazole or povidone-iodine gave 50% success rate
  • Disfiguring, painful and invasive
  • Last choice but indicated if cribriform plate not intact
  • Recent report of use of iodine cadexomer dressings in 3 dogs

• **Systemic antifungals**
  • Ketoconazole
    • 47% success rate
  • Fluconazole
    • 60% success rate
    • 2.5 - 5.0 mg/kg q12 hours PO
  • Itraconazole
    • 60 to 70% success rate
    • 5 mg/kg q12 hours PO
    • Minimum 10 weeks treatment

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**Lymphoplasmacytic Rhinitis**

• Reality or myth?
  • some authors (Mackin) claim it is common
  • other authors claim it is rare
  • commonly diagnosed on histopathology
  • no set criteria for what is normal and what is not

• Part of group of chronic rhinitides
  • lp rhinitis
  • eosinophilic rhinitis
  • hyperplastic rhinitis
  • polypoid rhinitis

• **Aetiology remains unknown**
  • allergic
    • humans - conjunctivitis, hayfever, seasonal basis, positive intradermal skin tests
• dogs - no conjunctivitis, no lower airway disease, only one report of correlation to skin tests
• dogs - increased IgG and IgM in nasal secretions

• irritant
• dogs - evidence of link to smoke inhalation
• immune-mediated pathogenesis - no proof
• fungal DNA recovered from tissue blocks

• Pathophysiology
  • lymphocytes, plasma cells
  • others appear secondarily
  • causes vasodilation, increased vascular permeability
  • congestion, oedema
  • serous discharge, lumen occlusion
  • mucoid hyperplasia, mucus accumulation
  • secondary bacterial proliferation, suppurative inflammation
  • rarely bone lysis, remodelling, epistaxis

• Signalment
  • young to middle-aged
  • dolichocephalic to mesocephalic
  • predisposition in whippets, dachshunds?
  • no gender predisposition

• Specific Signs
  • unilateral discharge (48%), bilateral 52%
  • even so, histologically usually bilateral
  • gradual onset, subtle
  • serous discharge changing to mucoid or mucopurulent
  • may not see discharge if post-nasal drip
  • variable obstruction to air flow
  • hypo-resonance of sinuses if fluid filled
  • +/- mandibular lymph node enlargement

• definitive diagnosis by histopathology only
• radiographic changes - subtle, diffuse
  • increased soft tissue/fluid density
  • mild loss of turbinate structures
  • asymmetry - especially rostral
  • thoracic films usually normal

• Response to antibiotics
  • present, but does not confirm or refute diagnosis
  • can help with removing suppurative component of inflammation

• Rhinoscopy
  • subtle, non-specific
  • hyperemia
  • hyperplasia of mucosa
  • uncommonly granulomatous/cobble-stone
  • rarely polypoid
• **Diagnosis**
  - Biopsies of the nose - can be ‘blind’ - changes seen bilaterally
  - mixed inflammatory response in mucosa and submucosa but predominantly lymphocytes and plasma cells
  - secondary eosinophils, neutrophils
  - +/- epithelial hyperplasia, squamous metaplasia, ulceration
  - +/- submucosal fibrosis, glandular hyperplasia
  - Flush cytology - of little value
    - nematode eggs?
    - nasal mites?
  - Culture of discharge - of little value

• **Management**
  - allergen/irritant avoidance
  - anti-inflammatory medication
    - glucocorticoids
    - immunosuppressives
  - antibiotics

• **match treatment to severity of signs**
  - Glucocorticoids
    - systemic use
    - prednisolone @ 2 mg/kg/day then tapering
    - initial response rapid
    - complete resolution can take months
    - excessive mucus production is last to stop
  - Nasal sprays
    - fluticasone @ 220 mcg spray bid
    - spacer required
    - where copious nasal discharge, may need systemics first
  - Immunosuppressives
    - corticosteroids ineffective or adverse effects
    - azathioprine
    - cyclosporine A
    - watch for side effects
  - Antibiotics
    - help clear secondary infection and lessen discharge
    - use for 1-2 weeks
    - doxycycline - immunomodulating properties?
  - Decongestants/Antihistamines
  - Interferon α

• **Prognosis**
  - usually good response
  - may take weeks to months
• may require lifetime management
• relapses common
• need to maintain therapeutic intervention

Nasal Foreign Bodies
• uncommon due to good sneeze reflex
• one study showed only 2 of 119 dogs with nasal disease (1.7%)
• awns, twigs, thorns, quills
• bullets, rocks, fishhooks, arrowheads, needles

• Specific Signs
  • sneezing
  • epistaxis - unilateral or bilateral
  • discharge - unilateral or bilateral
  • eventually chronic rhinitis

• Diagnosis
  • Clinical onset
  • Rhinoscopy
  • Plain radiography
  • Contrast radiography
    • 1 ml/5 kg barium sulphate via catheter
  • Where none found - biopsy!

• Management
  • remove under visual observation
  • vigorous flushing
  • ventral or dorsal rhinotomy

• Prognosis
  • Generally good
  • More challenging if more chronic
  • Complications of rhinotomy

Nasal Neoplasia
• 1-2% of all canine tumours
• 59-82% of respiratory canine tumours
• about 1/3 of all dogs with chronic nasal signs
• usually arise from nose and invade sinuses
• occasionally arise from sinus
• mostly malignant (80-90%)
  • locally invasive
  • rarely metastatic (0-12.5%)
• 60-75% epithelial
• Three most common: adenocarcinoma, lymphoma, undifferentiated carcinoma

• Gender difference
  • no difference
  • variable difference - m:f 1.3:1 to 3:1

• Age

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• median age at presentation 10 years (range 2-16 years)
  • sarcomas tend to be in younger dogs than carcinomas

• dolichocephalics and mesocephalics at higher risk
  • Airedale T, Bassett hound, Old English Sheep Dog, Scottish T, collie, Shetland sheepdog, German short-haired pointer
  • Another study found no breed differences
• brachycephalics are at reduce rate due to far less air movement through nose!
• but Boston T at 2.3X risk of other brachycephalics
• the greater the surface area of filtering mucosa, the greater the risk of developing neoplasia
• risk with exposure to tobacco smoke? flea products?

• Specific Signs
  • Respiratory
    • sneezing, epistaxis, reduced airflow
    • reverse sneezing, nasal discharge, snorting, dyspnoea, weight loss, facial deformity or swelling, pain
    • hard palate protrusion, palpable defect
  • Ocular
    • discharge, exophthalmos, blindness
  • Neurological
    • seizures, behavioural change, obtundation, neurological deficits
    • usually late
    • rarely presenting sign

• Diagnosis
  • Screening clinical pathology
    • anaemia
    • coagulation profile
    • hypercalcemia with adenocarcinoma
    • thrombocytopenia with adenocarcinoma
  • Chest radiography
    • metastases reported in 3 - 30% of dogs
  • Nasal Radiography
    • soft tissue opacities
    • loss of turbinate detail
    • signs of bony invasion
    • soft tissue/fluid opacity in the ipsilateral frontal sinus
    • cannot differentiate tumours based on radiographic appearance
    • greater tendency for carcinoma to cause bone lysis and facial swelling
  • CT, MRI
    • required for complete staging
  • Histopathology is gold standard
• risk of haemorrhage low (2/109 dogs)
• blind biopsy associated with higher negative biopsy result
• endoscopic guided biopsy superior
• rhinotomy rarely required

• Tumour Types
  • epithelial origin more common than mesenchymal
    • Epithelial
      • adenocarcinoma
      • undifferentiated carcinoma
      • squamous cell carcinoma
      • transitional carcinoma
      • neuroendocrine carcinoma
      • esthesioneuroblastoma
    • Mesenchymal origin
      • osteosarcoma
      • chondrosarcoma
      • fibrosarcoma
      • undifferentiated sarcoma
      • haemangiosarcoma
      • liposarcoma
      • leiomyosarcoma
      • myxosarcoma
      • rhabdomyosarcoma
      • malignant fibrous histiocytoma
      • malignant nerve sheath tumour
  • Round Cell Tumours
    • lymphoma
    • transmissible venereal tumour
    • mast cell tumour
    • malignant melanoma
    • paranasal meningioma
  • Benign Tumours
    • rare
    • oncytoma
    • pleiomorphic adenoma
    • adenoma
    • leiomyoma
    • angioleiomyoma
    • papilloma
    • fibroma
    • histiocytoma

• Management
  • Surgery alone INEFFECTIVE
  • same survival time as DOING NOTHING!
  • MST 4 months (range <1 month - 11.5 months)
  • plays part in preparation for orthovoltage irradiation
• Irradiation gives best results!
  • Published MST for orthovoltage 16.5 and 23 months
  • 1 year survival - 54%
  • 2 year survival - 43%
  • Cobalt irradiation - MST 18 months
  • Coarse fractions useful in high risk patients
• Irradiation
  • Adverse effects
    • oral mucositis
    • halitosis
    • rhinitis
    • moist skin desquamation
    • ocular complications
• Chemotherapy alone
  • limited information
  • cis-platin gave 27% response rate with MST of 20 weeks
  • Piroxicam 0.3 mg/kg sid (or meloxicam)
  • no correlation between extent of tumour and survival
  • sarcoma better than carcinoma in one study - no difference in another