How to approach the dog with nasal disease

Mellora Sharman discusses where to start with this canine presentation.

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The nasal cavity is designed to help modify air flowing through to the pulmonary structures by allowing air filtration, as well as regulating temperature and moisture content. By design, small or large foreign objects, including potentially irritant agents or infectious organisms, may be inhaled and trapped within the nasal cavity and result in nasal disease. Veterinary patients, particularly dogs, could also be considered at an increased risk of exposure to inhalation of foreign or infectious materials, given their keen interest in snuffling through the undergrowth. In our patients, the nasal cavity has a more complex structure compared with human anatomy which can challenge eradication of inhaled foreign materials and make diagnostics and therapeutic endeavours equally challenging.

Clinical signs and differential diagnosis

Most commonly, clinical signs associated with nasal disease include sneezing/reverse sneezing, stertor and nasal discharge. A combination of reverse sneezing and stertor may point us more towards a caudal nasal cavity disease focus, whilst forward sneezing and nasal discharge may be more indicative of a rostral focus. Assessment for predominance of rostral or caudal nasal cavity signs can help focus diagnostics on a specific region. It is, of course, important to remember that there are a variety of surrounding structures, disease of which can result in nasal signs. Equally, tumours or infectious processes can extend from the nasal cavity into other regions such as the peri-orbital space, or cranial vault, and this can result in significant ocular or neurological findings as well, or these can even be the primary presenting sign.

The author also advocates for careful evaluation of reported clinical signs or examination findings to determine if there is a risk of aerodigestive disease, whereby reflux may result in airway irritation including rhinitis.

The characteristics of any nasal discharge are generally non-specific and can be variable. Serous, serosanguinous, mucoid, mucopurulent discharge or even epistaxis may be reported or observed. Nasal planum depigmentation (Figure 1) is frequently associated with fungal nasal disease but should not be considered pathognomonic and can also be seen with chronic nasal discharge of other aetiologies. Importantly, the clinical signs associated with nasal disease can be remarkably similar across several different causes. Therefore, a logical approach using a differential diagnoses mnemonic such as DAMNIT-V can be helpful to organize potential causes of nasal signs.

- Infectious
  - Bacterial – usually secondary and opportunistic, or seen in conjunction with a primary pneumonia. Primary bacterial rhinitis may be more likely in cats
  - Viral – more likely in cats
  - Fungal rhinitis – *Aspergillus* spp. *Cryptococcus* spp.
  - Protozoal organisms – *Leishmania* spp.
  - Parasites – *Pneumonyssus caninum*
- Inflammatory/immune
  - Lymphoplasmacytic rhinitis
  - Non-specific rhinitis
  - Inflammatory polyps
- Miscellaneous
  - Inhaled foreign bodies
  - Dental disease and oronasal fistulas
- Neoplasia
  - Epithelial tumours – adenocarcinoma, squamous cell carcinoma
  - Mesenchymal tumours – osteosarcoma, chondrosarcoma
  - Round cell tumours – lymphoma, rarely mast cell tumours
- Trauma

FIGURE 1: Mucopurulent nasal discharge, and nasal depigmentation. Image courtesy of Bruce MacKay

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- Vascular
  - Coagulopathies – thrombocytopenia or thrombopathia are considered more likely to cause mucosal bleeding, compared with secondary coagulation disorders. These disorders will come with their own list of differential diagnoses to consider – for example, thrombocytopenia may be immune mediated (primary versus secondary) and can also occur with infectious agents
  - Vasculitis/vascular erosion – resulting from systemic inflammatory/immune-mediated disease, or secondary to infectious agents such as *Leishmania* spp., for example.

These differentials should be prioritized based upon presentation, signalment and physical examination findings. For example, an acute onset and persistence of sneezing fits after a bout of outdoor exercise might be most compatible with a nasal foreign body. Chronic mucopurulent nasal discharge in a young to middle-aged patient might raise concern for fungal rhinitis. Whilst a travel history might indicate a need to consider more exotic infectious agents such as leishmaniasis. On the other hand, stertor and epistaxis in an older patient would point us towards prioritizing nasal neoplasia.

Physical examination should evaluate the characteristics of any nasal discharge, as well as whether this is unilateral or bilateral. Airflow through the nasal passages can be assessed by holding cotton wool or a glass slide in front of each naris separately. Lack of airflow might increase our suspicion for an obstructive nasal lesion such as neoplasia but could also result from large amounts of accumulated discharge. Facial asymmetry, exophthalmos and/or difficulty with retropulsion of the orbit could suggest a space occupying lesion. Patients with marked inflammatory or invasive disease might show an indication of pain by being head-shy and whilst this may most commonly be associated with fungal rhinitis, other extensive or invasive disease might also be a cause of alterations in mentation or behaviour. Often, intracranial invasion is within the olfactory region and may only cause subtle signs of loss of smell which can be difficult to appreciate.

Adjunctive examinations and ophthalmological evaluation can also be an important consideration. The presence of epiphora unrelated to primary ocular disease might indicate involvement or obstruction of the lacrimal duct within the nasal cavity itself. Chorioretinitis might also be present with infectious aetiologies and fundic examination can, therefore, be helpful to evaluate for this, as well as evidence of hypertensive retinopathy or haemorrhage where indicated. Careful examination of dentition is worthwhile to look for oronasal fistula formation, or severe periodontal disease that could transfer inflammation/infection or foreign material into the nasal cavity; however, dental radiography might still be needed to exclude this possibility. Lastly, regional lymphadenopathy is not infrequent with inflammatory or infectious aetiologies, although of course can also be seen with metastatic disease and specific sampling may be warranted.

With any patient presenting with large volume epistaxis, an assessment for acute blood loss and hypovolaemic shock is important and may necessitate that therapeutic management be prioritized over diagnostics to improve patient safety and outcome.

Initial diagnostic testing

An initial diagnostic profile of haematology and biochemistry is commonly undertaken, although these diagnostics may be low yield for many primary nasal cavity diseases. Key considerations on haematological evaluation would include evaluation for significant anaemia (regenerative or non-regenerative) or thrombocytopenia where large volume epistaxis is noted or suspected. Primary haemostatic defects more commonly cause blood loss from mucus membranes, although extension to include secondary coagulation parameters still might need to be considered. Haematology might otherwise demonstrate non-specific inflammatory change.

A biochemistry profile rarely identifies a cause of nasal disease but may be important to assess if there is underlying organ dysfunction that might cause or contribute to haemostatic defects (primary or secondary) or that could contribute to hypertension. Increasing importance may be placed on performing a biochemistry panel for those patients presenting in the older age group given concurrent disease unrelated to nasal disease may be more likely and may change protocols around sedation or anaesthesia for adjunctive diagnostic procedures.

Additional minimally invasive diagnostics might otherwise include measurement of blood pressure, serology (*Aspergillus* spp., *Cryptococcus* spp., *Leishmania* spp., etc.) and use of PCR panels to detect various upper respiratory tract infectious agents. Infectious disease testing may be dictated by a combination of signalment and geographical factors and may not be definitive on its own. Depending upon the infectious agent, and serological assay, results can indicate prior exposure, quiescent carrier status or even return false positive (or negative) results. For sinonasal aspergillosis and leishmaniasis, additional diagnostic requirements such as confirmation of destructive rhinitis, or documentation of infectious agents would be preferable prior to instituting specific therapies.

It is not uncommon to feel that cytology of nasal swabs may be useful in the diagnostic process. Often, however, these only identify non-specific inflammatory reaction and evidence of secondary bacterial infection rather than the underlying primary cause. This can lead to over-prescription of antibiotics. Bacterial rhinitis is not considered a primary entity in dogs although it is a more important consideration in cats, and treatment of the underlying reason is likely to lead to more success. Previous studies have suggested that cytological identification of fungal elements can occur in normal

dogs, and therefore may not be indicative of cause. In studies on sinonasal aspergillosis, nasal swabs were shown to be the least reliable method of identifying fungal infection, indicating that cytological sampling in this scenario can lead to both false positive and false negative results. Cytological samples obtained via direct sampling of identified or suspected fungal plaques is therefore preferred.

Adjunctive diagnostics

At this point, where a cause is not yet clear, discussion may be needed on what differentials are considered more likely and whether the owner wishes to pursue treatment trials versus additional and more invasive diagnostics. Treatment trials with mucolytics, anti-inflammatories (glucocorticoid OR NSAID) and even nebulization might be preferred for those patients where there is a high index of suspicion for an inflammatory rhinitis. The use of doxycycline for its immunomodulatory effects is also often advocated for these cases but may also help manage secondary bacterial infection. If there is any indication that an aerodigestive disorder may be a component, then diagnostics directed towards underlying causes of reflux may need to be considered and/or an omeprazole treatment trial implemented.

In comparison, those patients with alarming signs such as severe epistaxis, facial pain/deformity or changes in mentation or any older patient, may be candidates for additional testing including diagnostic imaging.

A variety of options are available to assess further the nasal cavity. Whilst rhinoscopy can be performed alone, this is often performed in conjunction and following diagnostic imaging as the latter can be helpful to pinpoint a specific region of the nasal cavity for evaluation. Radiography, computed tomography (CT) and MRI have all been used to assess the nasal cavity, with the more advanced techniques providing much more detail on bone and soft tissue structures; however, good quality radiographs can still provide useful information.

Diagnostic radiography

Key considerations for diagnostic radiography of the nasal cavity are that general anaesthesia is a necessity for accurate positioning. Taking time to set-up radiographic views to ensure appropriate positioning and symmetry where needed, as well as use of a technique chart is also beneficial and reduces the risk of introducing tilting and asymmetry that can mimic disease. A combination of views helps us to assess various regions of the nasal cavity (Table 1).

Radiographic changes may be quite striking with obliteration of normal nasal cavity structures with soft tissue density material that could represent either nasal discharge or the presence of a mass. However, findings can be quite subtle such as can be the case with rhinitis. Figures 2 and 3 demonstrate unilateral destructive rhinitis and frontal sinus involvement, respectively, which is most typical of a diagnosis of sinonasal aspergillosis.

Advanced imaging

Advanced diagnostic imaging such as CT or MRI carries the disadvantage of most often requiring referral and can be expensive, but provides the distinct advantage of significantly more information by allowing detection of subtle change that might be beyond the bounds of radiographic detection (e.g. extension into the central nervous system or surrounding soft tissue structures). This approach can be preferable but might depend upon the individual circumstances surrounding the case as well as available finances.

Extension of disease into the frontal sinuses, orbital space or even intracranially across the cribriform plate is better able to be documented. These techniques can also improve targeting of adjunctive diagnostics, as well as allow for treatment planning when it comes to sinonasal aspergillosis and consideration for trephination or even nasal neoplasia and radiation therapy. CT is more commonly used than MRI, is quicker, provides better detail on bone change and is often useful to evaluate the thoracic cavity for concurrent or metastatic disease where indicated, although thoracic radiography can be performed instead.

FIGURE 2: Destructive rhinitis demonstrated by blurring and loss of turbinate detail on the right (R) side compared with the left.
Image courtesy of Ruth Dennis

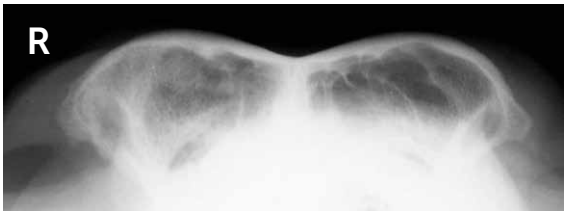


FIGURE 3: There is evidence of frontal sinus disease as demonstrated by hyperostosis of the frontal sinus bone, and an increased soft tissue density with the right (R) compared to the left frontal sinus.
Image courtesy of Ruth Dennis

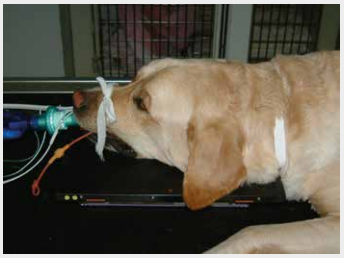
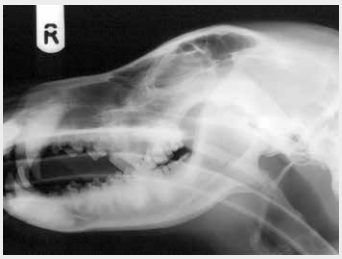
DV-VD Projection		
Laterolateral Projection		
Intraoral DV		
Open Mouth VD		
Frontal Sinus Projection		
Lateral Oblique		

TABLE 1: Recommended radiographic projections for complete nasal cavity and sinus assessment.
Images courtesy of Ruth Dennis

Rhinoscopy

Rhinoscopy is useful to evaluate the nasal cavity in more detail and to target biopsy sampling, but findings can be non-specific. Limited rhinoscopic evaluation can be performed with otoscopic equipment to evaluate the very rostral nasal cavity. It is, of course, important to recognize that this technique is limited; however, it might be useful where there is very rostral disease noted on diagnostic imaging, or where inhalation of a foreign body is suspected. The caudal nasopharynx can also be examined, in part, by using a spay hook to pull the soft palate forward in conjunction with a light source and dental mirror, with a patient in dorsal recumbancy.

Where available, rigid rhinoscopy in conjunction with retrograde flexible endoscopy will allow more complete assessment of the nasal cavity. The latter is achieved by either curling a flexible endoscope around the soft palate and pulling forward or by manoeuvring an endoscope already curved into a 'J' position sideways through the oral cavity before carefully twisting the scope dorsally in the caudal nasal cavity to position the tip above the soft palate and pulling forward (Video 1). A systematic approach is recommended to ensure all regions are evaluated adequately via antegrade rhinoscopy. Where frontal sinus involvement is suspected or documented, trephination and sinuscopy or sinuscopy using flexible endoscopes via an antegrade approach, may be warranted for assessment and sampling. The latter technique can be challenging unless there is significant erosion of turbinates around the nasal ostium and requires both good expertise and appropriate equipment.

Use of rhinoscopy to guide biopsy, or cytological sampling of suspected fungal plaques using brush techniques, can improve diagnostic yield particularly for nasal aspergillosis.[1] Whilst a previous study of three techniques for biopsy sampling in dogs with suspected nasal neoplasia showed no statistically significant difference between advanced imaging-guided, rhinoscopy-guided and blind biopsy methods.[2] Repeated biopsy samples were frequently required. Concurrent inflammatory change can overshadow findings of both infectious and neoplastic causes of nasal disease in the author's experience. However, the presence of a mass effect, particularly when observed using advanced diagnostic imaging techniques such as CT, is still considered most indicative of neoplasia all the same, whilst identification of significant destructive rhinitis should lead to ongoing suspicion of aspergillosis even where biopsy samples are negative for fungal elements.

Nasal flushing is also described as a diagnostic tool, but one that has limited utility. This may be most useful where a foreign body is suspected or to obtain materials for fungal culture where sinonasal aspergillosis or other fungal infection is suspected, in conjunction with other diagnostic findings. There is limited utility in nasal flushing for nasal neoplasia, although occasionally tissue can be obtained and submitted for histopathology. Nasal flushing may otherwise be therapeutic in removing accumulated mucoid material that can perpetuate clinical signs. Flushing can be achieved by placing a foley catheter within the nasopharynx and flushing forward; or alternatively, retrograde flushing into throat packs can also be attempted.

Biopsy samples should otherwise be submitted for histopathology or, depending upon the clinical suspicion and signalment, for fungal culture. Bacterial culture may also be considered, however, as previously mentioned, bacterial rhinitis is more likely to be secondary in dogs.

Treatment

Hopefully, assessment of the signalment and presentation, together with the above diagnostic approach, will have led you to a more definitive diagnosis, in which case, specific therapy can be directed towards this, be that managing dental disease or treating fungal rhinitis or neoplasia. However, it is of course important to interpret all parts of the diagnostic puzzle together in order to reprioritize any remaining differentials. The author does tend to warn owners at the outset that repeat evaluation and biopsy is not infrequently required, but will aim to treat suspected sinonasal aspergillosis without definitive diagnosis where all other diagnostic parameters seem to fit.

A diagnosis of chronic or lymphoplasmacytic rhinitis can be frustrating. There is no one-size-fits-all approach for these cases and cycling through various treatment trials is often needed. Similarly, to previously, this can include use of anti-inflammatory therapies, in conjunction with management of bacterial infection (primary versus secondary) or immunomodulatory antibiotic therapy in the absence of infection. Some cases appear to respond best to glucocorticoid anti-inflammatories (systemic versus inhalational), whilst others have better responses to NSAIDs. Both can be tried in succession where there has been an appropriate wash-out period in between. The author tends to choose systemic glucocorticoid therapy in the first instance, transitioning to inhalational to limit side-effects where successful and as 'maintenance' therapy where there are ongoing mild clinical signs. Where there is marked nasal discharge, nasal flushing to remove this in the first instance at rhinoscopy, in conjunction with use of mucolytic agents and/or nebulization can also be helpful.

Inflammation may also be improved by adjunctive use of immunomodulatory antibiotics. Doxycycline, for example, has broad spectrum antimicrobial coverage, but is theorized to be immunomodulatory. Other antibiotic choices may be more appropriate where dental disease and/or osteomyelitis is suspected with clindamycin often being preferred. A small number of cases may have allergic-type disease, the index of suspicion for which might increase if there are significant numbers of eosinophils present in biopsy samples and specific allergy testing could be helpful, although the evidence basis for allergic rhinitis in dogs is very limited. The author has had some success in chronic rhinitis cases with oral antifungal therapies for presumptive allergic aspergillus sinusitis, although this

has often been a last resort and the risks of therapy should be carefully discussed.

Conclusion

Nasal disease can be challenging as clinical signs are often similar across a range of underlying causes. Prioritization of differentials based upon the course of the clinical history, signalment of the patient and clinical findings is helpful. Whilst advanced imaging is often preferable to radiography, good quality radiography can be beneficial, and a diagnosis may be reachable in conjunction with rhinoscopy; however, non-diagnostic samples are not infrequent even where mass lesions are observed and repeat biopsy can be required and treatment trials initiated.

About the author

Mellora Sharman

Mellora graduated from the University of Queensland, Australia in 2003 and completed a clinical residency and Research Masters in Small Animal Medicine at Murdoch University in Perth in 2010, subsequently becoming a Fellow of the Australian and New Zealand College of Veterinary Scientists and a Diplomate of the European College of Veterinary Internal Medicine. After completing a PhD in gastroenterology at The University of Melbourne, Mellora relocated to the United Kingdom in 2014 first working as a maternity leave cover clinician at The University of Glasgow, before joining The Animal Health Trust in 2015 as a Senior Clinician. Mellora currently works as a Telemedicine Consultant for VetCT.

Reflect on your reading

1. Which of the following is NOT a sign of nasal disease?
   a. Sneezing or reverse sneezing.
   b. Stridor
   c. Stertor
   d. Nasal discharge
   e. All of the above.
2. True or False. Nasal cytology is a very useful and essential component of the diagnostic workup.
3. Which of the following regarding radiographs of the head for investigation of nasal cavity disease is true?
   a. Radiographs are a waste of time, and only advanced imaging is a useful diagnostic imaging modality.
   b. A combination of DV/VD, laterolateral projections, intra-oral DV, open mouth VD, frontal sinus skyline views and lateral obliques can be useful to evaluate the nasal cavity.
   c. Extension of disease through the cribriform plate is always able to be detected radiographically.
   d. GA is rarely required to take good radiographic views of the nasal cavity.
4. True or False. Chronic rhinitis will always respond to doxycycline and NSAIDs.

Answers available online in the BSAVA Library.

VIDEO CONTENT ALSO AVAILABLE ONLINE AT WWW.BSAVALIBRARY.COM/COMPANION

VIDEO 1: Retrograde rhinoscopy.

References and further reading are available at **www.bsavalibrary.com** and in *e-Companion*.

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