UPDATE ON FELINE NASAL DISEASE: WHAT HAVE THE LAST TWENTY YEARS TAUGHT US?

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INTRODUCTION

Chronic nasal disease in is a common problem in cats, an important cause of significant morbidity in feline patients, and a source of frustration for veterinarians, our clients and our patients. Symptoms of nasal disease may be caused by any of a myriad of primary respiratory disorders or non-respiratory causes. Idiopathic chronic rhinitis is one of the most common chronic nasal disorders in cats. It is a diagnosis made by exclusion of other disorders, and usually requires chronic management. Other causes of chronic nasal disease include structural, mechanical, neoplastic, parasitic, infectious, and allergic disorders. The diagnostic approach to chronic nasal disease should be designed to first identify or rule out primary nasal conditions with specific therapeutic options, then to secondarily manage chronic idiopathic inflammatory nasal conditions. Treatment of secondary infections and symptomatic therapy should be tertiary goals. The purpose of this session will be to review normal nasal structure and function in cats, to review the diagnostic approach to chronic nasal disease, and to discuss a therapeutic approach to chronic nasal disease based on feline nasal structure and function, with a focus on diagnostic and management options for idiopathic chronic rhinitis that can be done without referral.

OVERVIEW OF FELINE NASAL STRUCTURE AND FUNCTION

The nose is a structurally and functionally complex organ in the upper respiratory tract. It is the primary site of entry for inhaled air in the feline respiratory system, and therefore has many important and diverse functions. The nasal cavity functions to efficiently filter, warm, and humidify inhaled air before it enters the more delicate distal tracheobronchial airways and alveolar parenchyma of the lung. The nose serves as the principal organ for olfaction (the sense of smell). In addition to olfactory sensory function, the nasal cavity also serves as a sensory organ for the detection of irritants and noxious inhaled substances.

Gross and Functional Anatomy of the Nose

The feline nasal airway is divided into two passages by the nasal septum. Each nasal passage extends from the nostrils to the nasopharynx. The nasopharynx is defined as the airway posterior to the termination of the nasal septum and proximal to the termination of the soft palate. Inhaled air flows through the nostril openings, or nares, into the vestibule, which is a slight dilatation just inside the nares and before the main chamber of the nose. Unlike the more distal main nasal chamber that is surrounded by bone, the nasal vestibule is surrounded primarily by more flexible cartilage. The luminal surface is lined by a squamous epithelium similar to that of external skin.

The rostral main chamber in cats has two turbinates, the maxilloturbinate and the nasoturbinate, that emanate medially from the lateral wall of the main chamber. The main chamber is divided by the maxilloturbinate and nasoturbinate into a dorsal, middle, and ventral meatus. These turbinates are lined by mucosa containing abundant capacitance vessels that are under autonomic control. Dilation of these vessels causes engorgement of the erectile mucosal tissue, leading to nasal congestion. In the caudal main chamber, the ethmoturbinates emanate rostrally from the dorsal septum and the ethmoid bone. These turbinates are primarily lined by olfactory epithelium, and contribute to the acute olfactory capacity of cats. Feline turbinates have complex folding and branching patterns that serve to increase nasal airway surface area for filtration, absorption, conditioning, and clearance. These turbinates also divide the nasal airspace into multiple narrow, tortuous columns that are vulnerable to obstruction.

Nasal Breathing

The upper airways provide the majority of the resistance in the respiratory tree (up to 75% of the inspiratory resistance). While cats are technically capable oronasal breathers, many cats will maintain nasal breathing, even in the face of severe nasal obstruction or cardiopulmonary dysfunction. A switch to oral breathing in a cat

usually suggests that there is a significant reduction in cardiopulmonary reserve. It is therefore very important that nasal airway patency be preserved in cats presenting with *any* type of respiratory dysfunction.

After passing through the nasal vestibule, inhaled air courses through the narrowest part of the entire respiratory tract, the nasal valve (ostium internum), into the main nasal chamber. All nasally inspired air passes through the main chamber into the nasopharyngeal meatus prior to passage through the laryngopharynx into the lower airways. The cross sectional area of the nasal airways decreases by 4-5x between the main chamber and the nasopharynx, requiring an increase in flow rate to accommodate bulk flow. Because of this abrupt change in airway caliber at this site, even minor changes in the diameter of the nasopharyngeal airway lumen can have profound effects on inspiratory airflow and respiratory effort.

Nasal Filtration and Mucociliary Clearance

Most of the luminal surfaces of the nasal mucosa (with the exception of the most proximal regions of the nasal vestibule) are covered by mucus. Its physical and chemical properties are well suited for its role as an upper airway defense mechanism, filtering the inhaled air by trapping inhaled particles and certain gases or vapors. The mucus is produced by mucous (goblet) cells in the surface respiratory epithelium and subepithelial glands in the lamina propria. The synchronized beating of surface cilia propels the mucus and entrapped particulates from the main nasal chamber caudally to the nasopharyngeal meatus. With normal nasal function, secretions pass through a ring of nasal associated lymphoid tissue (NALT) surrounding the caudal aspect of the nasopharynx. Since this site is one of the first lines of defense against inhaled pathogens, dusts, and irritant gases, compromises in mucociliary clearance could lead to increased nasal infections and increased susceptibility to lower respiratory tract diseases. From this site, nasopharyngeal contents are cleared to the oropharynx, where they can be swallowed into the esophagus and cleared through the digestive tract or expectorated.

Olfactory Function

The ethmoturbinates lining the dorsal and caudal main chamber of the nasal cavity are lined by olfactory epithelium, a sensory neuroepithelium that is responsible for olfactory function. This epithelium contains bi-polar neurons that pass through the cribriform plate and synapse directly in the olfactory bulb of the brain. The vomeronasal organ (VNO), a paired tube-like structure in the ventral nasal cavity, is an important sensory organ of the accessory olfactory system. The VNO is involved in the detection and processing of pheromones, and can influence behavior and appetite in cats.

DIAGNOSTIC APPROACH TO NASAL DISEASES IN CATS

The initial approach to the patient with suspected nasal disease should be designed to verify that the patient's clinical signs and symptoms are due to nasal disease, and to localize the problem to a specific region or regions in the respiratory tract. Once the condition has been localized as precisely as possible, specialized diagnostic procedures can be employed to obtain a diagnosis.

For many reasons (cost, time, patient stability, etc.), the typical approach to most patients involves using the least invasive diagnostic tests early, and reserving more invasive diagnostic tests for later in the diagnostic process. When possible, I recommend staging the diagnostic process to rule out differential diagnoses in a slightly different way.

Because many cases of nasal disease are eventually treated empirically or symptomatically, I try to evaluate for the conditions that I know will not respond to routine empirical therapeutic options as early as possible. These include non-respiratory causes of nasal symptoms (alimentary, regurgitation and reflux, tooth root abscesses, hypertension, coagulopathies), and structural obstructive abnormalities (choanal atresia, choanal strictures, nasopharyngeal polyps, nasopharyngeal stenosis, nasopharyngeal turbinates, nasal foreign bodies). Next, I try to evaluate for neoplastic differentials. These may be life-threatening or time-sensitive. Clients may be more inclined to treat nasal tumors if they're diagnosed early in the course of disease. Next, I evaluate for differentials for which specific treatments (curative or palliative) exist. These include parasitic causes (mites, nematodes, Cuterebra), infectious causes (viral rhinitis, fungal rhinitis), and allergic rhinitis. My goal is to arrive at a diagnosis of idiopathic chronic rhinitis with the knowledge that non-respiratory, anatomic, neoplastic, and potentially curable causes have been ruled out as much as possible, in order to maximize the likelihood of treatment success for a condition that is difficult and frustrating to manage.

Minimum Database

My diagnostic approach starts with a CBC, serum chemistry, urinalysis, coagulation profile (in rare feline cases of epistaxis), and a blood pressure. In young cats for whom viral causes of rhinosinusitis +/- conjunctivitis are likely, I collect deep conjunctival, nasal, and tonsillar swabs for detection of Feline Herpesvirus and Feline Calicivirus by PCR. These tests are highly sensitive, particularly during active outbreaks, but may not detect latent viral infection during quiescent periods. Knowledge of this diagnosis early in cats can offer important prognostic information to clients.

Diagnostic Imaging

The three-dimensional evaluation offered by advanced imaging modalities (CT, MRI) is extremely valuable in the assessment of space-occupying or obstructive nasal diseases. In many cases, however, useful, and even diagnostic information can be obtained from a single, straight, intra-oral, dorso-ventral or ventro-dorsal radiograph. This view allows for the assessment of symmetry or asymmetry between the left and right nasal cavities, turbinate loss, mass effect, and nasal foreign bodies.

Rhinoscopy

Nasal endoscopy provides a detailed visual assessment of the nasal airspace and mucosal surfaces. Because of the strong nasal irritant reflex, rhinoscopy should only be performed under general anesthesia. If imaging studies are planned (CT, radiographs), they should be performed prior to rhinoscopy, as the presence of the endoscope causes hemorrhage, which can interfere with the interpretation of nasal imaging studies. Retroflex nasopharyngoscopy is typically performed with a flexible endoscope placed in the oropharynx and flexed 180° over the soft palate, providing a visual assessment of the walls and airspace of the nasopharyngeal meatus, and the choanae. Rigid endoscopes can also provide limited views of the nasopharynx and caudal nasal cavity by retracting the soft palate rostrally with a spay hook and directing the endoscope dorsally and rostrally into the nasopharynx. Anterior rhinoscopy is best performed with a rigid arthroscope or cystoscope directed through the nares into the left and right nasal cavities.

In addition to providing a direct visual assessment of the nasal cavity, rhinoscopy can also be used to guide diagnostic sampling of the nasal cavity (samples for cytology, histopathology), and can also be used for therapeutic intervention (e.g., nasal flushing).

Diagnostic Nasal Sampling

Because of the risk of potential complications, a lack of specialized equipment, and uncertainty about indications and interpretation of results, many practitioners consider diagnostic sampling of the respiratory system to be a daunting task. However, for many causes of nasal disease, there exist no pathognomonic hematologic or radiographic findings making cytologic or histopathologic evidence of the condition the gold standard for diagnosis. With potential risks (chronic antibiotic therapy, steroidal or non-steroidal anti-inflammatory, immunosuppressives) and potential costs (aerosol therapy) associated with empirical and symptomatic therapy, a specific diagnosis should be sought whenever possible. There are several techniques available that will allow the safe and successful collection of samples for cytologic, histopathologic, and microbiological analysis in a general practice setting.

Diagnostic samples from the nasal cavity and nasopharyngeal meatus should always be collected from anesthetized patients. Patients should be intubated with a cuffed endotracheal tube. The oropharynx should be packed with gauze to prevent aspiration of nasal contents during sampling. Patients should be positioned with the head level, or with the nose tipped slightly downward to facilitate collection of flush samples. Sampling devices should not be inserted caudal to the level of the medial canthus of the eye, to prevent possible trauma to the cribriform plate.

Cytologic samples from the airway surface can be collected using nasal flushing, cytology brushes, swabs, or impression smears from harvested tissue samples. Since collection of surface samples is safe and relatively easy, one could argue that they are indicated in the evaluation of any case of airway obstruction, nasal discharge, sneezing, or reverse sneezing. The trap in collecting cytologic samples is the risk of overinterpreting results. In general, nasal cytology is poorly correlated with histopathology, and surface

samples should not be submitted for microbiological culture. However, cytologic results can be reliable for certain conditions, including fungal rhinitis, allergic inflammation, and lymphoma [1,2].

Flushing can be performed in cats using a 5 Fr or 8 Fr red rubber catheter, or by inserting the luer tip of a 20 cc syringe directly into the nostril. Each lavage should be performed using 5-10 ml of room temperature buffered saline. Lavage fluid should be collected from both nostrils. Intact pieces of tissue or debris can be gently squashed between two slides, while fluid samples can be submitted for direct and cytospin preparation. Samples collected using nasal swabs or cytology brushes can be gently rolled onto microscope slides, or dispersed in EDTA (purple top tube).

Tissue samples for histopathology and macerated tissue culture can be collected by several techniques. A coagulation profile, platelet count, and blood pressure should be obtained prior to collecting nasal biopsies. Because of the small size of the nostrils and nasal cavity, most nasal biopsies are collected blindly, but rhinoscopic and diagnostic imaging studies can be used to estimate the intranasal location of lesions. Arthroscopic biopsy forceps can be used to collect turbinate biopsies and biopsies of focal lesions. Traumatic flushing or traumatic catheterization techniques can yield tissue fragments that are of suitable size and quality for histopathology and culture. Samples are collected using a 5-7 Fr polypropylene catheter with the tip cut at a 45° angle. Small, staggered notches can be cut into the length of larger catheters using a scalpel blade. 5 ml aliquots of buffered saline are repeatedly flushed into and aspirated from the nose while the catheter is raked along the nasal mucosa. Saline hydropulsion [3] is a less traumatic technique that can be useful for collecting samples from friable masses (e.g., necrotic tumors, fungal granulomas). A 20 cc Luer tip syringe filled with saline is placed directly into one nostril, while the contralateral nostril is digitally occluded. Saline is forcefully pulsed into the nasal cavity to dislodge tissue fragments, which can be collected in the draining lavage fluid or cleared from the oropharynx after removal of the gauze packing.

THERAPEUTIC STRATEGY FOR IDIOPATHIC CHRONIC RHINITIS

Once structural and anatomic abnormalities have been addressed, and other treatable causes of chronic nasal disease have been ruled out, a management plan for chronic idiopathic rhinitis should be developed. When possible, nasal biopsies should be collected for histopathology and culture. Most nasal biopsies will exhibit a combination of lymphocytic, plasmacytic, and neutrophilic inflammation in the nasal mucosa, with no identified etiologic agents. After biopsy, the nasal cavity should be vigorously flushed with room temperature saline to stop post-biopsy hemorrhage and to clear the nasal cavity of mucus and debris. This clearance of the nasal cavity helps to maximize the opportunity for a successful therapeutic plan, which should be treated in stages.

Secondary bacterial infections should first be treated, ideally with antibiotic selection based on tissue culture and sensitivity profiles. Lipid soluble antibiotics that achieve high concentrations in airway fluid are good first choices. When antibiotic selection is not based on culture results, empirical choices should be broad spectrum, including activity against common nasal opportunistic pathogens including *Mycoplasma spp* and *Bordetella*. Macrolides and azalides (e.g., azithromycin), fluoroquinolones, and tetracyclines are good empirical choices, and should be employed for three weeks.

Once secondary infections have been treated, I determine whether or not the rhinitis is corticosteroid responsive with a trial of anti-inflammatory prednisolone. I typically start at 2 mg/kg/day for 14 days, with regular communication with the client during this time. Ideally, if cats are corticosteroid responsive, I recommend starting a training period with a facemask and spacer device, and implementing inhaled corticosteroid therapy as soon as possible. I start at high inhaled doses of fluticasone propionate (220 µg metered dose inhaler), 2 puffs twice daily with a facemask and spacer device. Once inhalation therapy has comfortably been implemented, I start 25% dose reductions of the oral prednisolone every two weeks, with regular monitoring of clinical signs during the dose reduction. For cats who are prednisolone-responsive, but may not be candidates for inhalation therapy, I recommend a longer course of therapy at 2 mg/kg/day (up to 1 month), followed by a more gradual dose reduction (25% reduction every 3-4 weeks).

For cats with lymphoplasmacytic rhinitis who are not prednisolone-responsive, or for those patients who are prednisolone-intolerant or poor candidates for corticosteroid therapy, I usually start lymphotoxic therapy with an alkylating agent. Chlorambucil is well tolerated in cats, and has anecdotally been associated with improvements in clinical signs in some cases of prednisone-unresponsive chronic rhinitis. I start at 2 mg orally per cat every 48 hours. Monitoring should include a CBC prior to the start of therapy, with follow-up CBCs at 7 days, 1 month, and then every 3 months.

In cats with ongoing inflammation or severe turbinate loss, recurrent bacterial infections are an unfortunate but expected complication. These will typically manifest as an acute change in the volume and quality of nasal discharge, and a new onset of sneezing in a previously controlled patient. Since it may not be practical to biopsy and culture the nasal cavity with each flare, many recurrent infections will require empirical therapy. These infections should be treated based on the frequency of their recurrence. Infrequent infections can be treated as they occur. More frequent infections may respond to prophylactic antibiotic therapy (1 week per month). As a last result for frequently recurring infections, chronic antibiotic therapy protocols can be employed. Macrolide/azalide antibiotics can be employed chronically using every-other-day or every-third-day protocols (5-10 mg/kg every 72 hours).

Symptomatic therapy may also be an important management component of idiopathic chronic rhinitis. Most techniques are designed to facilitate nasal mucociliary clearance. Commercially available pediatric saline drops can be directly instilled in the nasal cavity to keep nasal secretions fluid and enhance clearance to the nasopharynx. Owners can instill 1 drop in each nostril once daily, using a dropper or syringe. Topical decongestants are vasoconstrictors that act on the capacitance vessels in the turbinates. These can shrink the nasal mucosa, open the ostia to the frontal sinuses, and facilitate sinus and nasal cavity drainage. Phenylephrine (0.125%) or oxymetazoline (diluted to 0.025%) can be administered at a rate of 1 drop in each nostril once daily. Topical decongestants should not be used for more than three consecutive days, as this can cause a rebound vasodilation and nasal congestion. For cats experiencing severe nasal airway obstruction, intermittent nasal flushing under anesthesia can help to clear the nasal airways, facilitate mucociliary clearance, and enhance the efficacy of anti-inflammatory and antimicrobial therapy. Finally, analgesics should be considered in cases with bony involvement (invasive nasal tumors, rhinitis with osteomyelitis), or to ameliorate post-biopsy pain. The injectable form of buprenorphine can be administered sublingually at 5-10 µg/kg up to every 6 hours. Tramadol can also be used in cats for nasal or bone pain at 2-4 mg/kg BID.

SUMMARY

While referral to specialty practice will always be an option, thorough diagnostic evaluation for chronic nasal disease can be done in most practice settings, and may not always require specialized diagnostics. Practitioners should be comfortable recognizing opportunities to provide definitive therapy, empirical therapy, and symptomatic therapy for these patients.

REFERENCES

1. Caniatti M. et al., Journal of Small Animal Practice 39(2): p. 73-77. 1998.
2. Michiels L. et al., Journal of Feline Medicine and Surgery 5(5): p. 279-85. 2003.
3. Ashbaugh E.A. et al., Journal of the American Animal Hospital Association 47 (5): p. 312-16. 2011.