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UPPER AIRWAY DISEASE –
HOW NOT TO GET TRICKED

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INTRODUCTION

Upper airway diseases obstruction are relatively common causes of respiratory distress in dogs and cats. However, because lung parenchymal diseases are more frequently observed, upper airway problems may be overlooked. In order to fully appreciate upper airway disease, it is essential to be familiar with the structure, function, and common abnormalities.

PHARYNX

The upper airway begins with the mouth, nose and pharynx. The principal role of these structures is the conduction of air. Additionally, they also serve to filter larger particle debris from the inspired air. Respiratory problems related to the pharynx generally reflect obstruction to airflow and are characterized by inspiratory distress. Common causes of pharyngeal airflow obstruction include brachycephalic airway syndrome (excessive soft tissues of the pharynx and elongated soft palate), abscesses (from penetrating objects like sticks), mucoceles and neoplasia (lymphoma or metastatic diseases). In young cats, nasopharyngeal polyps may also cause airway obstruction. Diagnosis is based upon visual examination ± biopsy. Therapy for pharyngeal diseases usually involve weight loss (for excessive tissues) or surgical intervention (elongated soft palate / nasopharyngeal polyps/mucoceles etc).

LARYNX

Laryngeal diseases are fairly common in small animals. The function of the larynx is to permit the flow of air into the lungs and also to guard the airway against aspiration of foods or liquids. The larynx is responsible for a large portion of the airflow resistance in the upper airway. Additionally, the larynx is responsible for vocalization. The neuromuscular control of the larynx is through the recurrent laryngeal nerve for the abductors (dorsal cricoarytenoideus is the most important) and the cranial laryngeal nerve (for the abductors). Clinical signs of laryngeal disease include noisy breathing, stridorous breathing, increased inspiratory effort, coughing and voice change. Signs may develop over time or may appear to develop acutely. Clinical signs are usually pronounced with exercise and may correspond with the first hot and humid days of summer. Auscultation over the larynx will reveal loud sounds, which may be referred into the thorax. The most common laryngeal problem in dogs is laryngeal paralysis. Laryngeal paralysis may be congenital (eg. Bouviers, Siberian Huskies, Rottweilers, Dalmatians) but is much more frequently acquired in large breed dogs. Commonly observed breeds of dogs include the Labrador retriever and setters although any breed may be affected. The cause is generally not identified. (Idiopathic) Hypothyroidism was historically thought to be associated with the development of laryngeal paralysis but this is no longer considered true. Rarely, afflicted dogs will have other signs of a polyneuropathy (megaeosophagus, generalized muscle weakness). In contrast to horses, clinical signs in dogs are usually associated with bilateral paralysis. In brachycephalic breeds (eg. Bulldog) laryngeal collapse may also occur. Other laryngeal diseases observed in dogs include webbing (after debarking surgery) neoplasia (squamous cell carcinoma, lymphoma etc) or abscess/granuloma (infectious). Everted laryngeal saccula (lateral ventricles) may develop secondarily to upper airway obstructions (and resultant translaryngeal pressure changes). Over time, these saccula may become fibrotic and contribute to permanent airway obstruction.

In cats, laryngeal diseases are much less common. Clinical signs in cats are similar to those observed in dogs. Rarely, cats with significant volume pleural effusions may appear to have upper airway obstruction. Laryngeal paralysis in the cat is frequently associated with neoplasia or may develop after neck surgeries (thyroidectomies). In cats, unilateral paralysis seems more likely to cause clinical signs. Cats may also develop laryngeal tumors (SCC, lymphoma) or granulomas.

Diagnosis of laryngeal disease is based upon direct visualization of the larynx under light sedation. Commonly used agents include thiopental (5-15 mg/kg) or propofol (2-6 mg/kg). Anesthetic agents such as ketamine or oxymorphone may affect the interpretation of the laryngeal motion so should be avoided. In evaluation of the laryngeal function, it is important to 1) have an assistant announce the timing of the respiratory cycle ("In" "Out" etc) 2) Be patient if the animal is too deep as this can lead to over-interpretation of laryngeal dysfunction. Doxapram (Dopram®) (2.2 mg/kg iv) may be given for the respiratory stimulation in order to better evaluate function . 3) Be comfortable with the normal anatomy (Even experienced clinicians may not be comfortable with normals despite intubating numerous dogs and cats) For evaluation of anatomy, the animal may be under deeper anesthesia. It is also prudent to have a plan of action after the laryngeal examination is complete. For example, in our hospital, we will often go straight into surgery following an upper airway examination or are prepared to perform a biopsy if a mass is identified. Additionally, if a “difficult” airway is suspected, it is wise to have several options available for providing supplemental oxygen and supplies for the emergent tracheostomy.

Therapy of laryngeal diseases depends upon the condition. Some conditions may be managed medically with mild sedation (acepromazine), anti-inflammatory agents (glucocorticoids) and weight loss (if indicated). Other conditions require surgical interventions. Laryngeal masses may be debulked with surgery and then further therapy such as chemotherapy or radiation therapy may be pursued as directed by biopsy results. Severe laryngeal paralysis is usually managed through surgery. Surgical options include arytenoid lateralization (“tie-back”) or partial laryngectomy. The surgical technique chosen is typically dependent on surgeon preference, although many individuals advocate the lateralization technique. Laser technology may also be employed. Temporary tracheostomy may be required for short-term management of the animal with severe upper airway obstruction. Cats may also be managed with a temporary tracheostomy although due to the smaller lumen of their trachea it may be more difficult to maintain a patent tube. Permanent tracheostomy may be indicted in animals with severe upper airway obstruction that is non-responsive to standard medical or surgical therapy. Permanent tracheostomy requires a dedicated owner, similar to other conditions that require daily therapy.
TRACHEA

The function of the trachea is to conduct air to the lower airways. The trachea also serves to help clear inhaled debris. Tracheal diseases are relatively common in small animals. These diseases may be most easily divided into anatomical problems and infectious problems. Clinical signs of tracheal disease include cough and noisy breathing. Tracheal problems may affect either an isolated segment of the trachea (ie cervical/ thoracic) or may affect the entire length. Common anatomical problems include tracheal collapse and hypoplasia. Tracheal collapse is mostly a problem of small breed dogs (Yorkshire terrier, Maltese, toy and miniature poodles). Clinical signs usually begin between three and six years of age although they may be observed at any age. Signs tend to worsen as the dog ages. Tracheal collapse may affect the cervical and/or the intrathoracic trachea. Observed signs will usually reflect the segment of the trachea affected. Cervical tracheal collapse will result in an inspiratory stridor and a cough, while intrathoracic tracheal collapse will cause chronic cough with either a classic “goose-honk” or a pronounced end-expiratory “snap.” The etiology of tracheal collapse is not clear. Certainly a genetic predisposition exists and research efforts have documented diminished levels of glycoaminoglycans in the tracheal cartilage of affected dogs. Additionally, obesity and concurrent chronic bronchial disease may magnify any existing tracheal abnormalities. Diagnosis of tracheal collapse may often be suspected from the history and physical examination. Confirmation of tracheal collapse may require radiographs, fluoroscopy (particularly helpful if available, as tracheal collapse is frequently a dynamic condition) or bronchoscopy. Tracheal collapse is typically dorsalventral although rarely lateral collapse has been described as well. Grading schemes for tracheal collapse have been reported. Management of tracheal collapse includes medical therapy and surgical therapy. Medical options for management of tracheal collapse include anti-inflammatory medications (prednisone), cough suppressants (eg. butorphanol, Tussigon®), weight loss, and sedatives (acepromazine). Occasionally, methylxanthines (eg Theo-Dur®) may be used. Most dogs with tracheal collapse may be managed as outpatients. A small percentage of dogs will present in extreme respiratory distress. Therapy for these animals includes supplemental oxygen and sedation. Intubation is to be avoided as it may be difficult to later extubate the dog. This form of tracheal collapse may be life threatening. Surgical management of tracheal collapse may be required for dogs with moderate to severe collapse. Several techniques have been described including external support with either spiral or ring supports (often made from 3 cc syringe cases). Internal support with tracheal stents have also been tried in some dogs with mixed success. In all individuals, it appears that the success of the various surgical interventions is dependent upon the severity and duration of the disease as well as the surgeon's familiarity with the technique. It appears best to consider surgical intervention prior to the development of severe clinical signs. Tracheal collapse has been reported in the cat, but it is very rare.

Tracheal hypoplasia is a congenital condition, largely of brachycephalic breeds and in particular the bulldog. Clinical signs include cough, stridor and dyspnea. Occasionally, dogs will have a concurrent bronchopneumonia. The diagnosis is typically made based upon thoracic and cervical radiographs in conjunction with appropriate clinical signs. For the normal dog, the ventrodorsal diameter of the trachea at the 3rd rib should be three times the width of the third rib. Alternatively, the ratio of the diameter of the trachea to the length of the thoracic inlet should be greater that 0.16. Management of tracheal hypoplasia includes weight loss and prevention, if possible, of pneumonia. The degree of the hypoplasia does not appear to correlate with clinical signs and many dogs may lead nearly normal lives.

Tracheal stenosis may occur secondarily to a variety of conditions. The most common is as a sequel to general anesthesia with over-inflation of the tracheal cuff, although tracheal stenosis may result following any form of trauma. Congenital stenosis has also been described. Clinical signs include moderate to severe respiratory distress, particularly on inspiration. Survey radiographs are usually diagnostic. Therapeutic options include surgical resection and anastomosis of the affected segment or possibly balloon dilation. Prognosis is guarded, as animals with severe clinical signs may be difficult to successfully manage.

Tracheal tears may occur in small animals following either traumatic events (bite wounds) or intubation for general anesthesia. Clinical signs include subcutaneous emphysema and mild to severe respiratory distress. Signs may follow anesthesia by up to 14 days. days and seem to be most common in cats undergoing dental procedures. Bite wounds require surgical exploration for successful management. Anesthesia-related tears are often able to be managed conservatively, although in cats with severe respiratory distress and significant extra-pulmonary air (eg pneumomediastinum and pneumothorax) surgical intervention may be required.

Tumors of the trachea are quite rare. Clinical signs are typically progressive respiratory distress and stridor. Diagnosis is usually made by survey radiographs or occasionally bronchoscopy. In young dogs, osteochondromas are the most common and in older dogs, chondrosarcomas and osteosarcomas have been described. Therapy is through surgical resection. Prognosis is dependent on the underlying tumor type.

Tracheal foreign bodies (rocks, marbles, plants, nuts, balls etc) have been reported. Clinical signs are a peracute onset of respiratory distress. Radiographs are usually diagnostic. Therapy is removal, either transorally, bronchoscopically or via surgery.

Infectious disease of the trachea are also common in small animals. Infectious tracheobronchitis (“Kennel cough”) may be caused by a variety of bacteria and viruses as well as environmental factors. Commonly implicated organisms include: Bordetella bronchiseptica, parainfluenza, and mycoplasma. Other bacteria such as E. coli, Klebsiella and Pseudomonas may also colonize airways after viral disease. Occasionally, it may be difficult to distinguish kennel cough complex from canine distemper virus. Clinical signs include a dry hacking cough commonly after exposure to other dogs (pet store, kennel) or stressful event (shipping). Frequently, the cough is so severe that owners believe “something is stuck in their throat.” Physical examination is usually unremarkable, although some animals have mild fevers (103 range) and seem depressed. Usually, tracheal palpation will trigger a paroxysm of coughing. Dogs that appear very sick may have a secondary bacterial pneumonia. Routine laboratory testing is usually normal. Radiographs are typically normal as well although they may show interstitial or alveolar infiltrates if the pneumonia is present. A tracheal...
wash may be performed for cytology and culture. Practically, this is not commonly performed unless an animal is severely affected or a large group of animals are ill. Treatment revolves around supportive care. Most cases will resolve in 1-3 weeks although some dogs continue to cough for longer periods of time. Antibiotics are usually used in animals showing systemic signs of disease (lethargy/depression/fever). In young puppies, the use of fluoroquinolones (Baytril) and tetracycline may be relatively contraindicated due to concerns about growing joints and teeth respectively. Cough suppressants are usually not indicated (or particularly effective). Affected animals should be isolated from other dogs and kennels completely cleaned with effective disinfectants (eg Chlorhexidine Nolvasan®, benzalkonium -Roccal®, others) Vaccination may be indicated in dogs at high risk (kennels, shows, etc) although it is not usually required in household pets.

*Filaroides osleri* infections result in the formation of nodules within the tracheal lumen near the carina. Clinical signs include chronic cough and exercise intolerance. Diagnosis may be suspected by the presence of raised tracheal nodules (bronchoscopy or radiography) and confirmed by the presence of embryonated eggs/larva in the tracheal mucus or via a Baermann fecal analysis. Fenbendazole (Panacur) is used in treatment.