Brachycephalic Upper Airway Syndrome

Kevin Benjamino DVM, DACVS

Objective:
- Define brachycephalic upper airway syndrome (BUAS).
- Provide helpful hints on how to assess the various aspects of BUAS and performing a thorough oral examination.
- Providing surgical techniques that can be used to help provide a successful outcome.

Overview:

A very common airway problem seen in small dogs and some bigger dogs is a syndrome termed Brachycephalic Upper Airway Syndrome (BUAS). This disease process affects brachycephalic dogs due to the development of their skull structure. This occurs due to early ankylosis of the growth plates of the skull. They can be thought of having the same anatomy as a doliocephalic dog in a much smaller area. As one could image, this can cause difficulty in the passage of air as it traverses through the nasal passage and into the naso- and oropharynx, causing an increased pressure.

Common breeds that are affected and grouped into the breed type range from the English Bulldog to the Cavalier King Charles Spaniels. Dogs that are affected by BUAS can present with many different symptoms that all involve the passage of air and include snoring, stridor, exercise intolerance, apnea and even gastrointestinal side effects such as vomiting and regurgitation. A common gastrointestinal problem encountered is hiatal hernias, which can sometimes resolve (or lessen in severity) with the treatment of the airway condition. There are factors that can worsen the signs such as weight gain, allergies, environment conditions etc. Factors that can be controlled should be addressed.

What makes up BUAS? The most common components of this disease are both stenotic nares and an elongated soft palate. These two features are commonly seen. Other components are everted saccules, hypoplastic trachea, and secondary laryngeal collapse. In dogs that have stenotic nares the cartilage that makes up the nares is generally thicker and more condensed and oftentimes more medially displaced which causes an obstruction. Also, the conchae can be altered and displaced causing further airway turbulence and obstruction.

Anatomically, the soft palate is just caudal to the hard palate and further divides the nasopharynx from the oropharynx. In the normal patient the soft palate will typically extend caudally to just touch (slightly overlap) the epiglottis. In patients with an active obstruction this can be seen to extend 1-2 cm past the epiglottis. Due to this extension past the epiglottis, this tissue can actively obstruct airflow into the
larynx and also become edematous and undergo inflammation. Inflammation from this airway obstruction can extend to the tissue surround the pharyngeal region.

Generally considered to be a secondary side effect of the aforementioned conditions, everted saccules can develop due to the presence of increased air pressure of a prolonged period of time. Laryngeal saccules are normal out-pouchings noted adjacent to the vocal folds. Normally they extend outward away from the airway. After being under constant negative pressure these out-pouchings will evert and extend into the caudal laryngeal lumen causing an obstruction. Another secondary effect noted due to the constant high pressure is laryngeal collapse. This generally occurs in later stages of the disease process and will progress in severity. There is a grading scale that is used to assess the condition. Grade I laryngeal collapse is present when the laryngeal lumen is narrowed by everted saccules. Grade II collapse is characterized by both everted saccules and the cuneiform processes begin to collapse inward and fail to abduct during inspiration. Grade III collapse is characterized by the addition of the corniculate processes inwardly folding during inspiration, which signifies complete collapse.

**History and physical examination:**

Most commonly the history of patients with BUAS are very similar. Generally, owners notice snoring and gradual progression of inspiratory stridor. Many times this will occur while the patient is a puppy and continue into adulthood. Other signs that are noted are increasing frequency of dyspnea especially during exercise or a hot environment. Another sign to look for in addition to the other is vomiting and/or regurgitation. This can be a compounding problem as it predisposes the pet to aspiration pneumonia.

On physical exam one of the first things that can be directly visualized is the nares being stenotic. The observant examiner will also note an increased upper respiratory noise with inspiratory stridor on auscultation. Typically the rest of the general physical examination is within normal limits.

Prior to performing a sedated oral exam various differentials should be on the list and should include neoplasia (oral/pharyngeal masses) tracheal collapse, laryngeal paralysis, lower airway disease and cardiac disease. Both lower airway diseases and cardiac disease can greatly exacerbate upper airway signs and if the patient is stable, these should be addressed first or at least concurrently.

**Diagnostic testing:**

In addition to direct visualization of structures it is wise to evaluate both the cervical region and thoracic region. This is most commonly performed with radiographs. Structures to evaluate include the oro/nasopharynx, trachea, lungs (for pneumonia, etc), and cardiac disease. If cardiac disease is suspected due to auscultation and radiographs, an echocardiogram is recommended. A complete
blood count (CBC), chemistry and urinalysis should be performed prior to anesthesia to assess total body function.
A very important part of the diagnostic workup performed just before surgery is the oral examination. One way to evaluate the upper airway is endoscopy of both the larynx and esophagus. This will provide a very thorough evaluation of the soft palate, ventricles and laryngeal function. An added value of endoscopy is for those patients that are experiencing vomiting or regurgitation. The lower esophagus can be thoroughly evaluated for common markers of regurgitation and biopsies can be acquired if needed.

Direct visualization is the most common way of diagnosing the associated factors of the brachycephalic dog. The nares are narrower than a normal dog and the airflow is distorted. For a sedated oral exam, the patient is typically anesthetized (light plane of anesthesia). Pre-medications are not used, as to not interfere with respirations. Multiple studies have shown no significant differences between induction agents. Propofol is a common induction agent used to a titrating effect. Once the patient has decreased jaw tone, the mouth is opened and the tongue is pulled forward and the larynx is visualized with a laryngoscope. It is important to have an assistant tell the examiner when the patient is inspire and expiring. The arytenoid cartilages will abduct actively during inspiration and passively during expiration in the normal dog. Evaluating the laryngeal function in these dogs is very important in differentiating laryngeal paralysis from laryngeal collapse. As mentioned above, there are different degrees of collapse and an accurate assessment is imperative when choosing the correct surgical technique. Also, it is very important to examine the rest of the oral cavity in addition to the length of the soft palate.

**Treatment:**

The mainstay of treatment for BUAS remains surgical, however some medical measures can also be taken. When considering medical management, it is important to focus on factors that can cause worsening of the signs, such as weight loss and allergies. Other factors to consider are housing the patient in a cool environment, avoiding the use of neck leads, decreased activity levels and the use of gastroprotectants for any concurrent vomiting or regurgitation.

There are many questions that arise when considering surgical management and one of the biggest is when do you consider surgery? BUAS can be seen even in puppies and it is recommended that an evaluation be performed in dogs that are predisposed to this condition. Early management can halt or delay the progression that is typically seen, especially when discussing laryngeal collapse.

When evaluating the nares, one must remember to resect an adequate amount of the alar fold extending to the alar cartilage. There are various methods to widen the nares. The most common technique is the vertical wedge resection, where a wedge of tissue is removed with the apex of the triangle at the dorsal surface. An
absorbable suture can be placed to control bleeding. It is important to make sure that the nares is wide enough to increase airflow. An alarectomy can be performed, as well, either with a blade or a CO2 laser. When using a laser, bleeding is controlled, however, the pigmentation of the cut surface may change color over time.

An elongated soft palate is one of the most common features of BUAS. The assessment and skilled resection is key. If too much is removed, then there is a communication between the oropharynx and nasopharynx. If not enough is removed then the problem still exists. Generally the soft palate can be pulled rostral, either with stay sutures or an allis tissue forcep. The most common technique employed is resection with metzenbaum scissors and suture. Sharp excision of the soft palate generally ensures the least amount of inflammation. Other methods, such as CO2 laser and Ligasure, have been described and can be successful. A landmark that can be used when determining where to make incisions is the caudal aspects of the tonsillar crypts. Also, attempt to make the soft palate just contact the epiglottis. Complications that can arise are as follows: bleeding, inflammation, chronic granulation tissue formation, and further elongation of the soft palate over time.

As mentioned previously, the presence of everted saccules characterizes the patient with stage I laryngeal collapse. There is some controversy as to whether or not everted saccules should be addressed surgically. Typically they can be sharply excised with metzenbaum scissors. Dependent on the condition of the patient a decision should be made as to address them or not. Some argue that more granulation tissue develops after removing the saccules.

With patients that have grade II and III laryngeal collapse surgical correction is more difficult. When collapse is present it is always recommend to correct what is correctable, however the larynx will never be functional again. Some propose modified laryngeal tieback procedures with mixed outcomes. A permanent tracheostomy becomes a very viable option. By performing a permanent tracheostomy the entire upper airway is by-passed.

There are times when temporary tracheostomies are indicated during the management of dogs with BUAS. Selection of these cases is key. If the operated patient is having difficulty recovering or starts to have problems post-operative (dyspnea) a decision to perform a tracheostomy has to be made quickly. The procedure is straightforward to perform. Be sure to have intravenous access to the patient for 24 hours after surgery. If the patient begins to have problems, induction is indicated and tracheostomy should be performed. Hospitalization at a hospital with 24 hour monitoring is crucial.

When counseling owners, generally dogs affected with BUAS have a favorable prognosis. Success is solely dependent on progression of disease. Education of owners should start when the patient is a puppy to avoid worsening. When a patient
progresses to laryngeal collapse prognosis changes greatly, as well as hospitalization time.

References: