

# THE CUTTING EDGE

A RESOURCE FOR REFERRING VETERINARIANS



## Brachycephalic Airway Syndrome

Joseph C. Glennon, VMD, Diplomate ACVS



### INTRODUCTION

Brachycephalic breeds (Boston terriers, Pekingese, Pug, Shih Tzu, Boxer, English Bulldogs, Lhasa Apso, Shar-Pei) are distinguished from other breeds by the conformation of their skull. While the width of the bones are normal, the shortened rostral portion results in compression of nasal passages and distortion of nasopharyngeal and laryngeal soft tissues. Specific anatomic anomalies that initially contribute to partial airway obstruction are stenotic nares, redundant pharyngeal mucosa, elongated soft palate and in some cases, stenotic trachea. Secondary changes that occur owing to increased resistance to airflow are eversion of the laryngeal sacculles and laryngeal collapse. This further complicates airflow turbulence and resistance. Affected dogs have inspiratory dyspnea, which is exacerbated by exercise, increased ambient temperature and humidity. As they work harder to breathe, upper airway inflammation, edema, and excessive mucus (phlegm) production further complicates the situation. Dyspnea, cyanosis, hyperthermia and collapse may result. The degree of obstruction often increases with the age of the patient.

Initially, these patients may present for snorting, dyspnea or excessively noisy breathing (stertor and or stridor). Breathing pattern and mucus membrane color should be noted at rest and after light exercise. Signs of dyspnea include retraction of lip commissures, open-mouth breathing or constant panting, forelimb abduction, exaggerated use of abdominal muscles, paradoxical movement of the thorax and orthopneic posture. Auscultation of the thorax is usually difficult and only referred upper airway sounds are appreciated. Radiographs of the thoracic cavity are indicated however, all stress should be avoided. Evaluate the films for tracheal or pulmonary parenchymal disease, as well as the cardiac size and shape. Evaluation of the caudal pharyngeal structures requires a light plane of anesthesia. A parasympatholytic agent should be used prior to anesthesia. Always have an endotracheal tube that is smaller than anticipated available for rapid intubation in the event of a crisis because oxygen saturation can drop quickly during anesthesia or sedation. An ECG should be monitored since these patients often have increased vagal tone and are predisposed to heart block. If the patient is too deeply anesthetized, the normal abduction and adduction of the arytenoid cartilages and vocal folds may not be

thoroughly appreciated. While evaluating the soft palate, care should be exercised not to pull the tongue forward. This will result in rostral displacement of the laryngeal apparatus making the soft palate appear excessively elongated. Because complete airway obstruction may occur during recovery from anesthesia, corrective surgical procedures are usually performed at the time of the initial evaluation. Early surgical correction of stenotic nares and elongated soft palate helps reduce the incidence of secondary laryngeal disease, which down grades the prognosis and requires more involved correction. Conservative management includes weight reduction, exercise restriction, sedation, corticosteroids, and elimination of precipitating causes. Unfortunately, prolonged conservative management may allow for further progression of soft tissue edema and elongation, as well as laryngeal cartilage deterioration.

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### STENOTIC NARES

The wing of the nostril (alar fold) is the nasal structure that collapses medially. During inspiration, the alar fold may collapse further causing complete occlusion of the nares. Removal of either a portion of the dorsolateral cartilage or the entire cartilage is recommended. Hemorrhage can be brisk due to the abundant vascular supply to the face. Complications are minimal and if this is the only cause for respiratory problems, results of surgery are usually rewarding.

### ELONGATED SOFT PALATE

The apex of the epiglottis usually lies just dorsal to, and just touches the soft palate. The soft palate usually extends no further than the middle to caudal aspect of the tonsillar crypt. It is considered to be elongated if it extends caudally beyond the epiglottis. In brachycephalic breeds, it often extends beyond and gets sucked into the laryngeal opening where it obstructs the normal passage of air into the trachea.

Removal of the redundant soft palate is recommended. Resection is performed to a level between the caudal end and the mid-point of the tonsils. Always be conservative because resection of too much tissue can result in nasopharyngeal regurgitation of food and water. Use of corticosteroids pre and post surgery helps to minimize swelling. Hemorrhage is a potential complication therefore, simultaneously resecting and suturing will help minimize this problem. Suction is also useful in preventing blood from accumulation in the laryngeal spaces. Upon completion of the surgery, the endotracheal tube should be left in place for as long as possible. Post-extubation obstruction may occur, necessitating reinduction and intubation. While some respiratory noise may remain, respiration should be improved. If the laryngeal cartilages are collapsing, prognosis is poor unless additional surgery is performed.

### **EVERTED SACCULES**

The mucosal lining of the laryngeal ventricles becomes everted due to the excessive negative pressure created by the increased inspiratory effort. This is usually the first stage of laryngeal collapse. As the mucosa prolapses, it becomes edematous and further occludes the laryngeal opening. Everted sacculles appear as bilateral, red, fleshy, globular masses located just rostral to, and usually obscuring the vocal folds. Peroral resection is recommended. The sacculles are grasped with long handle forceps and cut with Metzenbaum scissors. Hemorrhage and complications are minimal. Resection of the vocal folds at this time should also be considered.

### **LARYNGEAL COLLAPSE**

Laryngeal collapse represents an advanced and critical stage of brachycephalic airway syndrome. It can range from medial deviation of the cuneiform cartilage and aryepiglottic fold, to the entire laryngeal cartilages (cuneiform cartilage, aryepiglottic fold, and corniculate cartilage) being drawn both medially and caudally into the glottal opening during inspiration. The cartilages are usually soft and permanently deformed. Although laryngeal collapse and laryngeal paralysis may cause similar clinical signs, they are very different conditions. During anesthetic evaluation, the larynx can spasm to the point that endotracheal intubation may be nearly impossible, the patient and examiner should be prepared to perform an emergency tracheostomy.

Laryngeal collapse can be treated by peroral resection of the aryepiglottic fold and part of the corniculate process. Partial laryngectomy or arytenoid lateralization procedures are seldom beneficial (success rate of less than 50%) due to the permanent cartilage deformation and softening which results in continued collapse. Additional complications include hemorrhage, swelling, and aspiration pneumonia.

Permanent tracheostomy is the procedure of choice because complications are minimal, and prognosis is generally good. The stoma usually accumulates mucus, especially during the first 2-3 weeks after surgery and gentle cleansing is necessary. Some stenosis of the tracheal stoma is to be expected over time therefore, it should be made a little larger at the time of surgery. Excessive skin folds may be a cause for intermittent obstruction of the stoma, and vocalization is diminished or absent.

### **RECOMMENDATIONS AND OUTCOME**

In the young brachycephalic breeds that present for early respiratory problems, provided there is no laryngeal collapse, I will correct the stenotic nares, and resect the elongated soft palate and everted sacculles at the same time. This should help prevent excessive stresses on the laryngeal cartilages, and may delay or prevent eventual collapse. In the patients with laryngeal collapse, I recommend resecting the elongated soft palate and everted sacculles to prevent excessive phlegm production and problems with swallowing. In addition, a permanent tracheostomy is performed at the same time. Eventually, the stoma will require less intensive care, however twice daily hygiene is usually needed. Excessive hair may need to be trimmed from around the opening and the pet should be kept in a smoke-free, minimally dusty environment. They should not be allowed to swim. In general, by the time these patients return for suture removal, they have markedly more energy than ever before.

English bulldogs should also be evaluated for a hypoplastic trachea. On a lateral radiograph, measurements of the thoracic inlet diameter (TI), (distance from the ventral aspect of the first thoracic vertebrae to the inner surface of the manubrium), and the tracheal lumen diameter (TD) should be acquired. The median ratio of TD/TI in the normal bulldog is 0.116; for normal dogs of other brachycephalic breeds it is 0.157; and for normal dogs of non-brachycephalic breeds it is 0.208. Prognosis for bulldogs with tracheal hypoplasia (ratio < 0.116) can be considerably worse.

### **NEWS FROM THE FRONT OFFICE**

Larry Finke, Hospital Administrator

This is the first **Cutting Edge** since we moved into our new referral facility in Pattersonville, N.Y. Things are working out very well for us and our patients. We're looking forward to having **Paul S. McNamara**, DVM, join our surgical staff full time starting in July. In addition to our surgical services, we will be offering other specialties in the coming months. **Rhea Morgan**, DVM, DACVIM, DACVO, and **Rachel Ring**, DVM, DACVO, will be offering ophthalmology services one Friday per month.