

AIRWAY DISEASES

Professor D. White

1. Laryngeal paralysis
2. **The brachycephalic airway obstruction syndrome**
3. Chylothorax

BVetMed PhD DSAS DVR
Diplomate, ACVS Diplomate, ECVS
European, ACVS & RCVS Specialist in Small Animal Surgery
RCVS Specialist in Veterinary Oncology

Dick White Referrals
The Six Mile Bottom Specialist Veterinary Centre
London Road
SIX MILE BOTTOM
Newmarket, CB8 0UH

Tel: 44 1638 572012

Email: dw@dickwhitereferrals.com

II: BRACHYCEPHALIC AIRWAY DISEASE

Stenotic nares

The external nose of the brachycephalic dog is, in common with the remainder of the respiratory tract, considerably foreshortened and as a result the cartilaginous tissue of the lateral cartilages especially is broader and less rigid than is found in other breeds.

The airway at the level of the nostril is in some dogs may be virtually obliterated and this problem may be exacerbated during the inspiratory phase during which the cartilage because of its lack of rigidity may be drawn into the nasal sinus. Although some authors have considered the problem of stenotic nares to be inconsequential there is no doubt that airway obstruction at this level is extremely important since in the normal animal the external nose and nasal sinus represents at least one third of the resistance to the flow of air. Research has shown that not only does narrowing of the nares contribute to airway obstruction it also causes significant turbulence in the nasopharyngeal region which may underlie pharyngeal weakness. Management is directed towards resection of the bulk of the lateral cartilage to increase the airflow and also towards stabilising the remaining tissue by anchoring laterally to the integument.

Nasal sinuses

Although there is little that can be considered in terms of management there is no doubt that the relatively narrow diameter of the brachycephalic nasal sinuses contributes significantly to the overall resistance to airflow patterns in the upper airway. There is evidence too in favour of the development of the acquired secondary pharyngeal changes resulting from turbulent flow patterns resulting from the narrow nasal airway.

Overlarge soft palate

The brachycephalic soft palate is one of the major contributory features of upper airway obstruction. Although it is probably of normal dimensions for the mesocephalic dog of comparable weight its relative oversize in the compressed nasopharyngeal space of the brachycephalic causes obstruction of both nasal and oral airways. In addition, more severely affected patients may be dysphagic and become syncopal whilst eating.

Resection of the caudal aspect of the soft palate is considered the most practical option. The level of resection is important and generally should not be made cranial to the level of the tonsils because of the risk of nasopharyngeal reflux. In Bulldogs, however it is difficult to achieve over-resection. Although electrosurgical resection is practised by some surgeons removal with right-angled clamps followed by oversewing the pedicle with absorbable suture material is considered to be a safer option. Haemostatic control is crucial and even mild oozing at the site of surgery represents an unacceptable risk of postoperative airway obstruction. Relief immediately after surgery is often marked although this may deteriorate temporarily due to swelling at the surgical site and response to implanted suture material.

Tonsillar hypertrophy

Enlargement of the tonsils contributing to the obstruction of the airway is generally considered to be a secondary change. It may occur as a consequence of either:

- i) the conformation of the brachycephalic pharynx which tends to evert the tonsillar tissue from the fauces allowing them to be constantly irritated or,
- ii) the chronically-reduced airway pressures in the pharynx which tend to induce collapse of the structures in the pharyngeal wall or,
- iii) both of these factors.

Their relative contribution to airflow turbulence and obstruction is uncertain; however most consider their removal useful in improving airflow dynamics. The tonsils should be removed clamping the pedicle and oversewing this to control haemorrhage following sharp excision. Once again the value of electrocautery in this procedure is open to controversy.

Pharyngeal hypertrophy

The precise mechanisms whereby the pharyngeal wall hypertrophies and weakens is not clear but it is thought that turbulent airflow patterns created by obstructed airways further cranially, chronic negative airway pressures and obesity are important contributing factors. The mucosa of the pharynx may become thrown up into redundant folds which due to their inherent weakness permit partial collapse of the pharyngeal diameter during the respiratory cycle. In severe cases these folds may even totally obliterate the airway (so-called aryepiglottic entrapment) precipitating severe syncopal episodes. Resection of redundant mucosa may be indicated although improving pharyngeal rigidity is a less attainable goal.

LARYNGEAL EVERSION / COLLAPSE SYNDROME

Chronic respiratory diseases resulting in turbulent airflow and abnormal negative pressures in the lower respiratory tract or abnormal cartilage structure can initiate a progressive and degenerative sequence of events within the upper airway which eventually result in obstruction of the rima. In the early stages the mucosal lining of the larynx and pharynx become oedematous and chronically thickened. This process also involves the mucosa within the laryngeal ventricle and the saccules are consequently forced to evert into the ventral rima. As the condition progresses the laryngeal cartilages begin to lose their structural rigidity and collapse towards the midline. The leading and lateral edges of the epiglottis roll inward and the cartilage folds dorsally

towards the glottic opening. The weaker regions of the arytenoids, including the cuneiform processes, collapse medially drawing the corniculate processes with them. The rima is progressively narrowed by these processes and in the final stages is completely occluded. The early changes involving the saccules and pharyngeal tissue are often reversible and may be resolved by prompt management of the underlying problem. Changes involving the cartilages are, however, more permanent and once clinically-evident laryngeal collapse is a difficult condition to manage.

3a: Aetiology

Airway obstruction syndromes: the development of LECS is most often associated with concurrent upper airway obstruction syndrome. It is frequently encountered in the brachycephalic dogs in which the overlarge soft palate, stenotic nares and hypoplastic nasal sinuses are responsible for upper airway turbulence. It is unclear, however, if it is this airway turbulence during the inspiratory phase or the presence of weak laryngeal cartilages that are unable to resist deformation during the expiratory phase which allow the problem to develop. LECS may also be encountered as the sequel to other obstructive airway conditions such as tracheal collapse and hypoplasia.

Congenital: laryngeal collapse is seen as an infrequent presentation in young English Bull Terriers during the first year of life. There is some indication that a congenital cartilaginous anomaly resulting in a weak, non-rigid larynx rather than airway may underlie the condition.

3b: Clinical presentation

Laryngeal collapse results in stridorous breathing and severely restricted exercise ability. In the brachycephalic dog the onset of these signs is insidious and often difficult to separate from those caused by the remainder of the obstructive airway syndrome. Ongoing exercise intolerance following surgical management of the overlarge soft palate and tonsils and the stenotic nostrils, however, should alert the clinician to the possibility of degenerative laryngeal changes.

3c: Diagnosis

Dogs with laryngeal collapse have severely obstructive upper airway function. Auscultation directly over the larynx should enable the stridorous turbulence to be detected but in brachycephalic dogs it may be difficult to distinguish this from the accompanying stertor. Laryngeal inspection in mildly affected dogs will reveal the glistening pea-like, everted laryngeal saccules immediately in front of the vocal folds

whilst in more advanced cases the rima will be obscured by the inverting epiglottis and arytenoids.

3d: Management

Conservative

In many dogs laryngeal eversion/collapse is a progressive process and hence early detection and management of the underlying disease is essential to limit the ultimate extent of the condition. Upper airway obstruction in brachycephalic dogs should be relieved at an early age by lateralising the nares, shortening the soft palate and resecting hyperplastic tonsils or redundant pharyngeal mucosal folds. This may relieve the turbulence and abnormal airway pressures sufficiently to permit remission of the earliest changes within the larynx (ie: mucosal oedema and eversion of the saccules) without additional management. For this reason it is essential that every effort should be made to correct the underlying pathology before any surgical intervention involving the larynx itself is undertaken. The judicious use of anti-inflammatory drugs may be helpful in promoting resolution of the laryngeal changes after upper airway surgery.

Resection of laryngeal saccules

In cases where the laryngeal changes are limited to chronic eversion of the saccules which does not respond to conservative management resection of the everted tissue may be performed. The patient is prepared for surgery as for partial laryngectomy and positioned in sternal recumbency. The everted saccules are identified as small, red pea-like protrusions immediately behind the vocal folds and grasped with dissecting forceps. The saccules are resected through their base with fine scissors and haemorrhage is controlled by direct pressure over the site. As is the case for laryngectomy procedures the risk of postoperative aspiration may be reduced by temporary tracheostomy intubation.

Partial laryngectomy

Resection of the vocal folds and arytenoids has been used in the management of LECS. The long term results, however, are poor due to significant postoperative complications and the need for repeated surgeries to maintain the airway. Major intralaryngeal resection is therefore no longer recommended in the management of laryngeal collapse.

Permanent tracheostomy

Permanent tracheostomy is effective in the management of many advanced cases of laryngeal collapse since not only does it provide immediate upper airway by-pass but it also relieves the abnormal airway pressures responsible for the degenerative changes involving the larynx. Permanent tracheostomas should be managed by careful cleaning during the initial 2-3 weeks when tenacious tracheal secretions may tend to occlude the opening. Thereafter, once daily cleaning is sufficient to maintain its patency. Long term problems include skin fold obstruction and stenosis of the stoma.

Tracheostomy must be regarded as a salvage procedure and the long term prognosis for dogs with advanced laryngeal collapse is very guarded. Techniques such as arytenoid lateralisation, designed to alleviate the signs of laryngeal paralysis by enlarging the rima are notoriously ineffective in the management of LECS since the rigid cartilage 'chassis' essential for the success of the procedure is no longer present.