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The Brachycephalic patient

Mini Series

Session One: Brachycephalic obstructive airway syndrome: patient assessment

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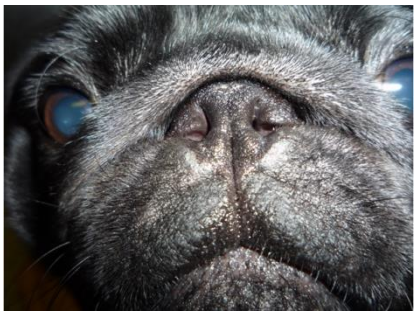

CPD Solutions: The Brachycephalic patient – Session one

The Brachycephalic obstructive airway syndrome – patient assessment

Brachycephalic dogs are a product of human breeding programs which began in the 1800s. The large eyes and flat face appearance of dogs with this conformation is suggested to engender a strong human-animal bond due to their resemblance to human babies. Generally brachycephalic breeds have a docile temperament, which has factored further in their rise in popularity. There has been a dramatic increase the ownership of brachycephalic dogs in the last decade. In particular, the UK Kennel Club registration of French bull dogs has increased by a factor of 3000 in recent years. As veterinary surgeons, the patients we treat are now very commonly brachycephalic. Dogs with this dramatically altered conformation have many associated health conditions: the most common and debilitating is brachycephalic obstructive airway syndrome (BOAS). BOAS may affect the dog's quality of life from a young age and can cause life threatening problems. It also complicates management of any other health condition that requires a veterinary visit or anaesthesia. It is clear that something needs to be done to address this very serious welfare issue in our companion animal population and there have been campaigns by the British Veterinary Association, BSAVA and some celebrities to try and raise awareness and address these issues. Brachycephalic research groups at Cambridge Veterinary School (https://www.vet.cam.ac.uk/boas) and The Royal Veterinary College, amongst others, have active research programs trying to understand the condition and improve the welfare of these dogs. Whilst we can look to the future when, hopefully, dogs that are affected in this way are not common place, it is currently essential as a veterinary surgeon to have a good understanding of considerations for these patients and what we can do to improve their welfare. It is vitally important however that we do not accept the conditions that these breeds are affected by to be "normal".

Terminology

Brachycephalic refers to the short skull conformation where the muzzle length is much shorter than the cranial length (facial foreshortening).

Dolichocephaly refers to a longer skull conformation than would be expected relative to its width.

Mesaticephalic refers to a skull with the cranium and nasal cavity of about equal lengths. This conformation is seen in a majority of dog breeds.

Craniofacial ratio is measurement of the muzzle length (nasal planum to stop) divided by the cranial length (stop to occipital protuberance, measured with a soft tape measure following the curvature of the face).

Brachycephalic obstructive airway syndrome (BOAS)

The shortening of the muzzle without proportionate shortening of the associated soft tissues leads to excessive tissues within the nasal cavity and pharynx, resulting in restricted and turbulent air flow. The restriction to airflow can lead to an increased effort to breathe and high negative airway pressures, which together with the turbulence, leads to airway swelling and secondary changes which further exacerbate the problems. Whilst it is well recognised that this condition affects brachycephalic dogs, hence the name of brachycephalic obstructive airway syndrome, until recently there was little evidence within the veterinary literature about how the extent of muzzle foreshortening actually correlated with the risk of suffering from BOAS. In a study on facial conformation and how it impacted upon BOAS, Packer et al 2014, demonstrated that BOAS only occurred in dogs whose muzzles comprised less than half their cranial lengths and that BOAS risk increases sharply in a non-linear manner as the relative muzzle length shortens.

BOAS is a chronic respiratory problem that affects the quality of life and stress and exercise tolerance of affected dogs. Clinical signs of BOAS include exercise intolerance, stertor, stridor, coughing, dyspnoea, tachypnoea, gagging, regurgitation, vomiting, and syncope. The dog's owners can sometimes be unaware of the debilitating effect the respiratory compromise is having on their dog and recognise the stertorous noises they make to be "normal" for them. It is not uncommon therefore for a BOAS dog to present to the veterinary practice at the time of an acute crisis. This may be due to heat stroke and collapse or exacerbation of upper respiratory tract obstruction resulting in dyspnoea and tachypnoea and restlessness. BOAS patients will also be seen at the veterinary clinic for routine health checks, which is an opportunity to thoroughly evaluate the degree to which BOAS is affecting the individual and to discuss routine husbandry recommendations and precautions and to consider whether further intervention, such as corrective surgery, may be required. Brachycephalic patients also present to the veterinary clinic for other health conditions and what may have been a subclinical problem with BOAS (or not recognised as a problem by the client) can precipitate into an acute respiratory crisis, in particular if the dog is painful or stressed.

Primary components of BOAS

Elongated and thickened soft palate

Stenotic nares

Large thick tongue which displaces the soft palate dorsally, further compromising the airway.

Cricoid cartilage stenosis (Rutherford et al, 2017)

Concurrent hypoplastic trachea (most common in the English Bull Dog)

Secondary changes associated with BOAS

Everted laryngeal saccules (grade I laryngeal collapse)

Laryngeal collapse (grade II & grade III) – loss of rigidity of the laryngeal cartilages.

- stage II there is medial displacement of the cuneiform processes of the arytenoid cartilage
- stage III there is collapse of the corniculate processes of the arytenoid cartilages with loss of the dorsal arch of the rima glottidis

Tonsillar eversion and hypertrophy

Pharyngeal muscle hypertrophy

BOAS and regurgitation can go hand in hand due to the increased negative airway pressures created during BOAS resulting in gastric reflux an oesophagitis, further exacerbating the issue. Careful evaluation and communication is essential to try to tease out if the regurgitation in this patient is a secondary BOAS related issue or whether it is the primary problem, for example as a result of a hiatal hernia. History taking should include detailing the level of exercise the dog will tolerate.

Clinical evaluation

Whilst it can be straightforward to make the diagnosis of BOAS in a brachycephalic breed that has upper airway noise, there are some importance considerations and some valuable nuances to their assessment that have been developed as clinical experience has accumulated with these patients.

In the consultation room a routine physical examination should be conducted to rule out any concurrent disease. Careful assessment of the cardiovascular system (cardiac auscultation, palpation of peripheral pulses and assessment for pulse synchronicity, mucous membrane colour and capillary refill time) should be performed to rule out cardiac causes of poor exercise tolerance or collapse. Neurological evaluation should also be performed, in particular if the history is of syncope or collapse.

Thoracic auscultation can be challenging as adventitial lung sounds may be masked by referred upper respiratory tract noise, however efforts should be made to carefully auscultate the whole lung field. Brachycephalic dogs may often have some degree of aspiration pneumonia, in particular if they have a history of regurgitation. A less frequent, but recognised, condition in which a diagnosis may be suspected following auscultation is lung lobe torsion in the pug. The pleural fluid that develops may allow a ventral loss of lung sounds to be appreciated along with loss of lung sounds in the region of lung lobe torsion.

In the consultation room assessment of BOAS is not complete: the external nares are the only part of the upper respiratory tract that can be directly visualised. There is a varying degree of narrowing of the external nares in these breeds. According to Poiseulle's law, the resistance to flow is inversely proportional to the radius of the tube through which flow occurs to the fourth power. Evaluation of the oropharynx and larynx can only be conducted under a light plane or anaesthesia. This allows the length of the soft palate and thickness to be evaluated and the larynx assessed. In addition the area should be carefully assessed for secondary changes or any other pathology that may be present (neoplasia, paraural abscess, foreign body etc).

Careful assessment of the type of respiratory noise the dog is making is useful to assess the nature of the obstruction and this may be useful in terms of assessing patient risk when hospitalised or not proceeding with treatment or aid in information clients before a procedure. Riggs et al 2019 have demonstrated that the presence of stridor as a component of the upper respiratory tract noise is strongly predictive for the presence of laryngeal collapse (there is a very high specificity (100%) and moderate sensitivity). Stridor is the high pitch squeak that occurs during inspiration and differs from the deeper more variable stertorous or snoring like noise. The sensitivity for detecting the laryngeal stridor was increased when the patient was subject to a 3 minute exercise test prior to auscultation (from 60 to 70%). Riggs et al, 2019 concluded that: inclusion of a 3-minute trot test and careful auscultation for laryngeal stridor are recommended during BOAS assessment of brachycephalic dogs.

Exercise tolerance tests may also be used as an objective means to assess the dogs' ability to exercise. This is useful for assessment pre and post operatively (around 6 weeks) to document if there is objective clinical improvement in the patient and note if there may be any problems. It may also be valuable to use as a tool in routine annual healthy checks for brachycephalic breeds as an objective means of evaluating the pet and communicating to the client how they are coping with exercise and what effects it is having upon their cardiovascular and respiratory parameters. This form of screening may allow identification of those dogs that would benefit from further assessment and potentially corrective airway surgery before they have an acute crisis. Villedieu et al 2019 published the validation of a six minute exercise tolerance test as an objective measure of BOAS assessment and outcome from treatment. This simple but effective test looked as how far the dogs were able to walk in six minutes and evaluated heart rate, respiratory rate and effort before and after exercise and post-exercise time for recovery. It must be remembered that when exercise tests are considered, some patients may not be suitable candidates to be exercised, in particular if they are experiencing a

degree of respiratory distress. This would be identified on the pre-exercise assessment of parameters and clinicians must be careful to avoid precipitating a crisis.

A research tool that is now becoming a tool for clinical evaluation is the use of whole body barometric plethysmography. This involves the dog being placed in a sealed chamber which allows pressure changes associated with ventilation to be recorded. Lui et al 2016 have validated and used this tool extensively to improve understanding of upper respiratory tract obstruction associated with BOAS.

Once the brachycephalic patient is hospitalised, regardless of the reason for initial presentation, it is prudent to ensure that they are kept calm and quiet and that thorough and regular monitoring is performed. Clients must be made aware of the risk of stress and issues of acute decompensation following hospitalisation, as this occurs even in brachycephalic patients in which the clients perceive their breathing to be normal. An in hospital patient monitoring score for all brachycephalic patients has been developed in the author's workplace and this scoring system prompts regular patient reassessment and appropriate intervention objectively.

Further evaluation

Further assessment of BOAS, and whether the dog is a suitable candidate for corrective airway surgery, requires oropharyngeal and laryngeal examination under a light plane of anaesthesia. This is covered in the next session, along with details of surgical correction and emergency management. Once anaesthetised and intubated, imaging of the thorax is routinely recommended mainly to rule out the presence of aspiration pneumonia. It is also valuable to allow evaluation of the width of the trachea. Tracheal hypoplasia presents a significant limitation to how corrective upper airway surgery may improve patient outcome.

What can we do to help improve canine welfare?

Use the BVA/KC reporting forms to report any conformational altering surgery.

If a client comes to discuss purchasing a new puppy, whilst it may prove futile to recommend that they choose a non-brachycephalic breed, it may help to advise them to check the parents and to choose a breed line that has a slightly better facial conformation, as there is evidence that this could make a difference to their pet. Hopefully breeding regulations will change that will mean this welfare issue does not continue in the future.

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